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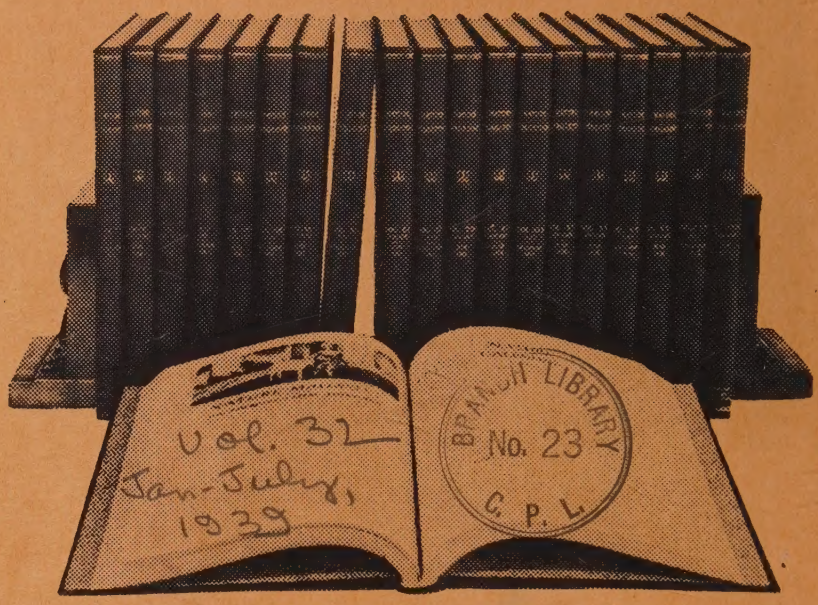

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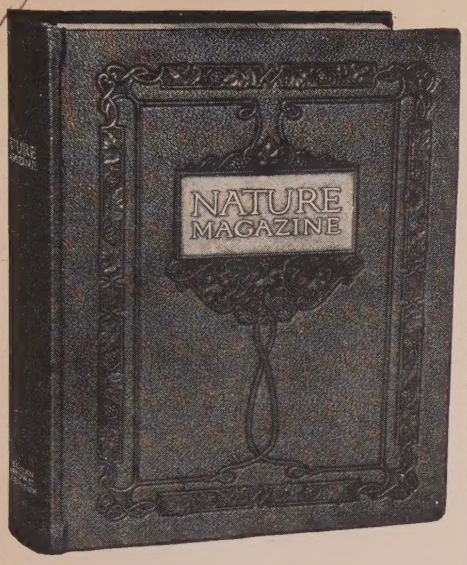

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A Beautiful Book

Back in the early days of NATURE MAGAZINE an article with fine pictures was submitted by a girl in Kansas. Her name was Lorene Squire. Since then she has taken thousands of pictures, but written too little. In fact, she finds the photograph her happiest method of expression, and that it is an effective method is proved beyond question in a beautiful book entitled *Wildfowling with a Camera*. Devoted almost entirely to pictures of migratory waterfowl, this book presents, in large size, the finest of Miss Squire's fine negatives. With it is brief but adequate text that gives us the feel of the duck marsh and the prairie slough; of birds at dawn and at dusk; of the fall and spring migrations; of duckling and wise old leader of the flock. It is a book of which its author-photographer may well be proud, and her publishers, J. B. Lippincott Company, have collaborated with a fine piece of printing and book making. The price of $7.50 is not too much for such a fine and permanently valuable volume.

West Coast Birds

Bird lovers of the West will welcome *Birds of the Pacific States* by Ralph Hoffman. Prepared with particular emphasis on field identification, this is a complete and accurate reference work. There are ten color plates by Allan Brooks and many line drawings. Mr. Hoffman prefaces his scientific description of each bird with a paragraph or two of less formal information about the species, thus making the book of interest and value to the beginner in ornithology as well as the better-informed student. The publisher is Houghton Mifflin and the price is $3.50.

The Weather

Through picture, chart and text, Gayle Pickwell presents the story of weather in an interesting and attractive book entitled, simply, *Weather*. His subject is, of course, a most popular and a most important one, and while this volume is not designed to make everyone his own weather prophet, it does contain a great deal of information to that end. The author describes the component parts of what we loosely describe as "weather" and gives us a picture of their relative place in the general scheme. His pictures are both beautiful and descriptive of phases of weather phenomena. The book is published by McGraw-Hill at three dollars.

Wren Hardware Dealers

When the Flaglers, who live in Westfield, New York, put up a wren house in the spring their own home had just been reroofed and the yard was littered with assorted nails and bits of eaves-trough wire. By fall, rains had curled the roof of the bird house and when it was taken down for repair it appeared to be half full of twigs, with the nest in one corner. The contents of the house included 188 nails of the common variety, old-fashioned wrought-iron nails, and roofing and shingle nails, seven pieces of bent wire, one screw and one safety pin. The whole exhibit weighed three-quarters of a pound.

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Camera Trails

BY NORRIS W. HARKNESS

Snow is a helpful ally in making records, in interesting and artistic pictures, of the passage of bird or beast whose picture "in person" we might never have the good fortune to catch. Each wild traveler leaves behind him in the snow a fascinating trail that often offers opportunity for fine pictorial composition as well as unusual subject matter. We may come upon the whole story written clearly for us and our camera—tracks of a stalking animal, the leap, the trampled patch and perhaps a few feathers or some fur. Such an episode demands a series of shots to make the story complete. As Nature photographers we must be sure that we have reported the entire action in every possible detail, and have made each scene into a picture that has sufficient pictorial value to stand alone as a worth-while photograph. We shall have done less than our best if we fail in either direction.

Such a series of pictures may be made easily with any kind of camera, although one that may be focused at fairly short distances will naturally be best. Usually a tripod is of great assistance since we will need to stop the lens down to gain depth of field in the shots. We shall need to use the smallest possible diaphragm opening to make all the picture area as sharp as possible. This usually requires exposures of such length as to forbid holding the camera in the hand, and while it might be rested on something solid during the exposure, we do not always have that convenient something unless the tripod is available. Panchromatic film is best for these pictures, and a filter like the medium-yellow or K-2 may be used to good advantage in rendering the tones of the shadows. Cross lighting—light falling at an angle on the tracks with the sun at right angles, or thereabouts, to the line of the camera—will make the shot more effective, and still more dramatic effects are attained when the light is coming toward the camera. But when we work "toward the light" we must be sure that the lens is protected from the direct rays of the sun. A lens-hood or sun-shade is a necessity to keep the light—either direct or reflected from a nearby drift—from hitting the lens and causing flare, which shows in the negative as a loss of brilliance when the effect is small, or may result in a hazy circle on the negative when the sun itself actually strikes the lens. The exposure will be fairly short, but we must remember that we are exposing for the shadows, not the bright whites, and that we must not make it so short as to lose the details in the darkest parts of the picture. In bright sun, shooting across the light, the exposure will probably be about 1/50 of a second at f/11 when using a film like Agfa Superpan and the K-2 filter, but when shooting such unusual things it is safer to make two or more exposures of each scene varying the time so as to be certain of getting everything exactly as it should be. An exposure meter generally saves many times its cost in the saved film and pictures it gives us, but the lack of a meter should never prevent our getting good pictures if we think a bit as we go along. One word of caution. So thrilling a series of shots gains much from the theme of wildness and aloneness: intruding human footprints will kill the effect. If they appear in the picture area, erase them before making the exposure. They will be much more difficult to eliminate later.

Such pictures generally mean trips away from home for most of us, but the city dweller who has little time can often get most excellent results from a ramble in a nearby park where squirrels and pigeons may supply splendid opportunities for the "living" pictures, and where the snow on the trees and bushes looks very much as it does in the farthest country. The shadow pattern on the side of a drift or on an incline makes a good picture, and there are many opportunities for landscapes when the ground is covered with snow and the dark trees stand out against the whiteness. But we must not shoot carelessly and hope that some of them will be good. Really good pictures are not made that way. We must decide just what makes us think the scene worth taking and study the composition through our view-finder, or on the ground-glass, until we can know that we are including just what we want to have in the picture and—more important still—that we have excluded whatever will lessen the value of the finished print. Then is the time to shoot. In photography haste certainly makes waste.

Snow scenes at night are easy and exciting. The reflections from the snow light up details that would otherwise be lost, and the entire picture becomes luminous and pleasing. Of course, a tripod or other support is needed for the exposures will run from two to thirty minutes, depending on the amount of light and on the diaphragm opening used. In case of doubt in making night pictures, use the longer exposures, but err on the other side in sunlight. Too long an exposure, then, will result in loss of crispness and striking highlights. In all cases it is wise to keep a record of the stop and exposure actually used and to study this record when the prints are before us, and next time we will have experience as a guide.

There are unlimited fields for the camera when snow has fallen. If we can get to work soon after the storm, there are snow-laden branches and bushes to offer pattern pictures against the sky. A darker filter, such as an orange or red, will make the contrast between the picture and its sky background more pronounced and make the clouds—if we are lucky enough to have them—stand out more vividly. When such filters are used, the exposures must be increased to make up for the light absorbed by the colored glass. The orange filter will usually need about twice the exposure that is called for with the K-2 in place, and the red will need three or four times that with the K-2. The maker of the filters you use can supply you with their "filter factor", and with that information you can quickly determine how much more time need be given when any one of them is used.

We have been talking about still shots in black and white. The opportunities are just as fine for the movie fan and the color man, and the same general precautions should be taken. Kodachrome should receive an exposure of about 1/25 of a second at f/8 to f/11 when the sun is bright, and the color worker who has never made a snow shot will be delighted at the range of colors in pictures that seemed to be made of black and white scenes.

So let's not put our cameras away with our white flannels to await the coming of spring. The snow months have much to offer us.

Enlarging Equipment

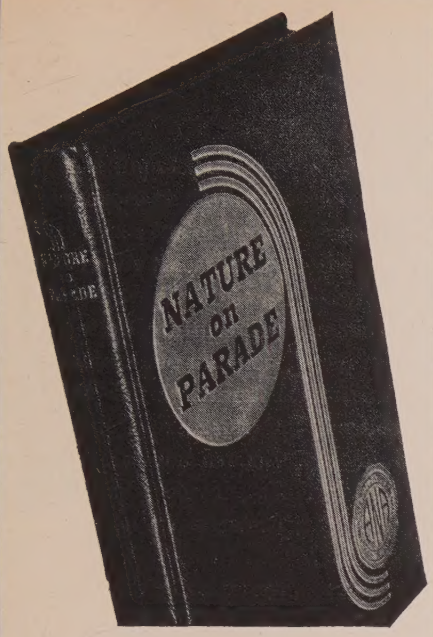
Enlarging is similar to contact printing in its principles, but it is much more fun and permits far more influencing of the final picture, in addition to allowing us to make it of nearly any size we desire. The general idea is the same; we let the light shine through the negative on a sensitized paper that differs from the paper for contact prints only in its speed. When the proper exposure has been given—and we determine it just as for a contact print—the print is developed, fixed and washed, just as with the contact print. Since most of the prints will be larger than the negative, we shall probably need larger trays than we have been using, but the chemicals used are the same. The only addition to the dark-room equipment is the enlarger itself.

Machines for making enlargements vary widely in price and in design, but they are fundamentally alike in that each has a light source, some method of spreading the light evenly all over the picture area, a device to hold the negative flat and in the right plane and place, and a lens that may be focused like the one on the camera. These working parts are so mounted together that they may be moved up and down on a post to vary the distance of the negative from the sensitive paper, which is held on a flat board that also serves as the base of the entire machine. Since we are discussing enlargers for amateur work in limited quarters we shall confine ourselves to those that work vertically and that use incandescent bulbs for their light, although there are machines that work horizontally and several other light sources are available.

In purchasing an enlarger, the first requirement is mechanical. The construction must be such that the base and the working head shall remain perpendicular to each other and that the whole shall be firm. The second thing in importance is the negative carrier. If the negatives are large, we cannot avoid holding them between glass to make them stay flat, but the smaller ones stay in place well between cut-out metal holders that give far less dust trouble. Whichever arrangement is chosen, it should be convenient to take out of the machine and so designed as to make the placing of the negative exactly where we want it as simple as possible.

Then we should consider the ventilation of the lamp-house. A bulb becomes quite hot, and if the housing is not sufficiently ventilated, the heat is likely to affect the film and cause it to buckle or stick to the glass carrier. The focusing mechanism must be positive and smooth, for the image will have to be as sharp as we can make it when the final picture is to be big, and the method of moving the whole head on the post should be simple with a quick operating lock to hold the head wherever we want it.

Two methods—or a combination of both—are generally used to diffuse the light. One involves a condenser lens or lenses and the other a plate of opal or ground glass between the light and the negative carrier. The condenser types work faster and cut sharper, but have the disadvantage of making dust on the negative seem more annoying, while the dif-



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Henry Herbert of 485 Fifth Ave., New York, have an interesting new publication called *The Guidepost* that will be mailed to all NATURE readers on request. Tell them you saw this and want to receive the news regularly.

We have found a book that has given us a lot of ideas and an inspiration to wander in new fields of picture making. The book *Lighting Ideas in Photography* is by William Herschaft and Jacob Deschin. Mr. Deschin, with whose books every amateur is familiar, and Mr. Herschaft, a lighting engineer, have done a splendid job in filling their pages with suggestions for new types of work combined with enough details of the methods to make our start easy. "One-Shot Montage" will appeal to every imaginative photographer. *Lighting Ideas in Photography* is published by Whittlesey House, New York, at $2.75.

Good tongs are a big help in keeping our hands and nails from looking too photographic. The new Duckbill tongs, distributed to your dealer through the Raygram Corporation at 425 Fourth Ave., New York, are strongly made and cost only seventy-five cents a set of two. One pair is black for the hypo, and the other is red so that they will look white in the safelight of the dark-room.

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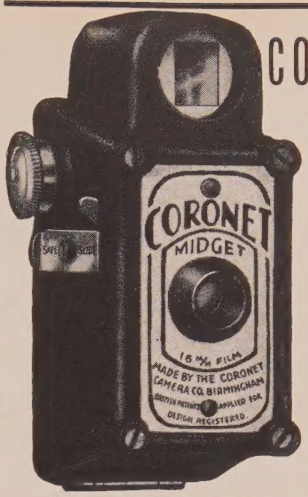

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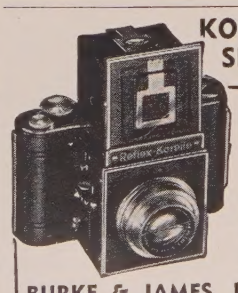

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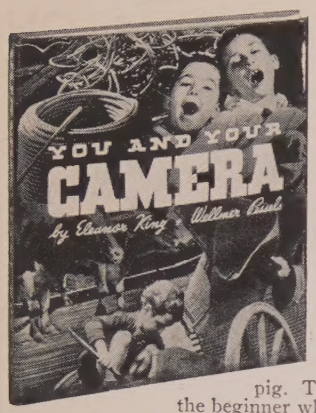

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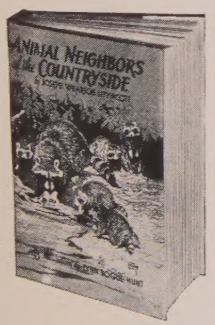

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CAMERA TRAILS

(Continued from page 3)

sometimes difficult to remember what time should be given for some other stop to get the same exposure. On practically all cameras, the diaphragm opening is changed by a factor of two when the indicator is moved one space. Similarly, the shutter speed is doubled or halved when the control is moved one notch. The following table gives equivalent exposures; that is, negatives shot at any of these combinations will have the same density and will vary only in the depth of the field that is sharply focused:

Stop	1.4	2	2.8	3.5	
Time	1/1000	1/800	1/400	1/250	sec.
Stop	4	5.6	6.3	8	
Time	1/200	1/100	1/80	1/50	sec.
Stop	11	16	22	32	45
Time	1/25	1/10	1/5	1/2	1 sec.

The Eastman Kodak Company has a new small tripod that will help the Nature photographer, and fit in well with the winter's indoor plans as well, in the Table Top Tripod, which sells for $1.75. Kodak has also announced the Pan-a-pod, a revolving head for the Table Top Tripod or any standard tripod, and the Tilt-a-pod, a tilting top that fits any tripod. The Pan-a-pod is listed at $3.00, and the Tilt-a-pod at $2.50. The three may be purchased together for $7.00, and will be valuable for both still and movie cameras. All Eastman dealers will soon have these accessories or full information may be obtained by writing the company at Rochester, New York. Please do not forget to mention NATURE MAGAZINE.

We want to emphasize as strongly as possible to the readers of this department that it belongs to you. It and its conductor are granted space in NATURE MAGAZINE for one purpose only—to do our small part to make your photographic efforts more fun, more satisfying, and more productive of the kind of pictures you want to make. This can be done only with your assistance. You alone know just what your problems are; you alone know exactly what you prefer to have presented to you in these columns; you alone are in a position to make the department what you wish it to be by letting your conductor have your criticisms and suggestions. Your letter will help us.

And remember that we shall be glad to help in the solution of your own particular photographic problems if we can. A letter to the department—your department—will receive our best attention.

A Robin Record

An interesting record of robin nest building is called to our attention by Mr. George C. Atwell of the Audubon Society of New Hampshire. In 1928 the quarterly of the society printed a picture of a robin nest built on the conical top of a Packard bird feeder set out for chickadees. Recently another picture of the nest was published, showing its growth after successive years of addition. For eleven years the site has been used, the nest added to ten times and two broods of robins raised each year. It is now quite an imposing pile.

Sells 19 Features In Six Months

"I have sold, up to date, nineteen features to the Detroit Free Press and have been made their correspondent here," writes Mrs. Leonard Sanders of 218 Union St., Milford, Mich., on completing the N. I. A. course. Her skilful handling of feature stories was the reason given by the editor for her appointment. Mrs. Sanders' first feature was sold less than four months after she enrolled with N. I. A.

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Indoors and Out

By HOWARD ZAHNISER

JANUARY is a month for journals. The impulse to keep a daily record, which sometimes seems to be an innate urge, is annually prompted by Christmas gifts of books with blank pages—followed a week later by the arbitrary beginning of a new calendar year somehow or other associated with good resolutions. If all the Christmas gift diaries were collected I think we would have excellent records of how people live—in January, but a continued unrelieved eleven-months curiosity. Many people, myself included, would do better I think to apply their January journal impulses toward the reading of journals already written rather than the production of personal fragments.

The Log of Tanager Hill, by Marie Andrews Commons, published recently by the Williams and Wilkins Company for $2.50, makes the suggestion seem further apropos. At a meeting of the American Ornithologists' Union in 1922, Mr. and Mrs. Commons became interested in bird banding. They took up this scientifically useful hobby at their Tanager Hill home on the shore of Lake Minnetonka in Minnesota with an unusual intensity that carried them through eight years, 1923 to 1930. Mrs. Commons in retrospect sees their bird-banding as first of all "a growing, absorbing interest" for her husband, whose "failing health necessitated the sacrifice of strenuous occupations and amusements." And her book is first of all a memorial to Mr. Commons, who unfortunately has not survived to re-live his bird-banding excitements by reading it.

The Log of Tanager Hill includes a remarkably complete tabulation of the "station's" bird-banding records and a summarizing discussion of the records for the 25 species that were recaptured, but the main text has an interest that is by no means limited to bird-banding or bird-banders. Each day is a human adventure, and among Mrs. Commons's sharpened perceptions is a nice awareness of the changes of the seasons.

Only one January is described in this log, the banding season in most years running from April through November; but 1926 covers all the months save December, and the January notes well represent Mrs. Commons's comments on the months, besides being peculiarly appropriate on this page. On New Years Day in 1926 Mrs. Commons wrote: "I must draw my inspiration from the blue shadows on the snow, from lacework of barren branches against the sky, from the deep green of pine branches laden with white, and the shimmering sparkle of the Lake locked in ice. The trees are alive with chickadees today; in the woods the stillness is broken by their constant cheery 'dee-dee' and the distant musical sound of a cross-cut saw and the voices of men at work in the trees."

The next day she saw chickadees, nuthatches, downy and hairy woodpeckers, brown creepers, tree sparrows, redpolls, goldfinches, and juncos. On the twentieth in the morning, in "a world so white that one can no more look at it than into the midday sun," she followed footprints of horses in the snow, marvelling "that horses took such long steps"—until she reached the pasture gate and "stood inhaling the fragrance of the woodpile." That evening she observed: "There is no color lovelier than that of tawny weeds and the golden-bronze of trees and branches against a blue sky when the sun is in the west." And on the twenty-third she banded two chickadees, "tiny spitfires that delight in pinching bits of flesh with their needle-like bills," and watched fifteen pheasants flushed from an alfalfa field, "not all at once but one after another, like clay pigeons released from a trap."

These are samples of many passages that give an added value to this book on bird banding. It will be a long time before any bird-bander's record duplicates Mrs. Commons's descriptive passages with their outdoor overtones, or her success in suffusing matters of fact with the tenderness of "emotions recollected in tranquillity." Perhaps it will be enough for most of us to do our banding vicariously, and I know of no better guide than *The Log of Tanager Hill.*

Another Minnesota journal for January diarists who grow weary of their own jottings is in *Canoe Country,* by Florence Page Jacques, with 40 black and white illustrations by Francis Lee Jacques, published by the University of Minnesota Press for $2.50—a record of a canoe trip planned by Mr. and Mrs. Jacques in winter but carried out in August and September, in northern Minnesota, where there are "hundreds and hundreds of lakes scattered through forest, like pieces of a mammoth jigsaw puzzle scattered over a table."

Ding Darling is reported to have exclaimed over *Canoe Country:* "Oh, boy, what a book! And the most glorious bunch of illustrations I have seen since Fuertes' day. . . . My personal compliments to Francis Lee Jacques. . . . No one that I know of today has done such an exquisite job of draftsmanship and rendering." I myself bow to Mr. Darling and take the words from his pen. I feel that these illustrations would make a book themselves, and the combination they make with Mrs. Jacques's prose seems nicely appropriate as a remembrance of companionship in a canoe.

The great effect of this book on at least two readers (another wife and husband) has been the stirrings of anticipations for more canoe trips of their own. Mrs. Jacques's descriptions of winter plannings, her discussions of equipment, and her list of provisions have sent these readers to the basement where the *Alisonoward* is in dry dock and to the attic room where there are knapsacks, duffel bag, blankets, and tent. January has its own outdoor enjoyments, its armchair comforts and pleasures, but one of its greatest delights is in planning excursions. *Canoe Country* whets the appetite, just as *The Log of Tanager Hill* suggests the richness of reminiscence. And one recalls with a sense of fitness that the god Janus had a face for both the past and the future.

"HE WAS CROUCHING BENEATH THE BUTT END OF A WEATHERBEATEN LOG . . ."

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The Spirit of the Wild

In which courage, endurance and sacrifice are fused

By JOHN LINDSEY BLACKFORD

Illustrated by R. Bruce Horsfall

INFINITE patience, matchless endurance, unswerving loyalty, and incomparable fortitude—of such is the spirit of the wild. There is readiness for self-sacrifice, too, yet we find wild life hoping, striving, carrying on, even until death. Deep-rooted is its love of life. Each individual is ruled by the instinct to share in and contribute to the destiny of the race. Each wild creature lives wisely according to the tenets of its being. This, then, is the spirit that characterizes the wild, whether it be in vast wilderness or in small nearby covert; and it is through association and kinship with life in the wide outdoors that we may ever hope to renew within ourselves these ennobling instincts.

It is in the surging run of salmon, the seasonal tides of vast aërial hosts, and the great treks that still take hoofed herds across continental tundras that this spirit becomes dominant, victorious. Therein truly is expressed that perfection of the intangible which we can best and most simply call the spirit of the wild.

A continuous, wet, mid-February snowfall slanted in at the open car window when I had stopped beside the road to observe a small flock of pallid horned larks. Driving, swirling and eddying, turning sometimes almost to rain, the snow made the wind seem even colder. The chilling slush drove in upon my face and against the lenses of the binoculars held in numbed hands.

There were thirteen in the little group of larks, including males, females, and young of the preceding year. They had been attracted to the roadway by a few scattered wisps of dry grass blown from some bulky sledload of hay. Passing machines interrupted their gleaning, and sent them winging away into the bordering fields of white. Yet the undaunted group wheeled about before dropping to the barren surface of the snow, and, a hardy band of adventurers, returned each time to their scanty fare. I watched them shatter and shake out seeds from the few heads of redtop so providentially left them.

Although buffeted by the chill gusts and swept by the cold rain and wet snow, the handsome males seemed not to mind, nor did their mates show discomfort. But February's harsh blasts and days of hunger had left marks of privation on the younger birds. Although readily proving their spirit at the hands of a brusque Nature, their gait as they moved about was not the steady pace of their parents but a sort of toddling run. Their plumage was wet, and each appeared a bit bedraggled and hunched up by the cold.

Yet no one of the small intrepid migrants showed real distress. Every member of the courageous troop was industrious in the search for food. These meager scattered wisps of hay, these few lean weed stalks accidentally strewn along the roadway, were their provender, their only evident fortification against the forbidding cold. And the larks were going north!

The wild has ever kept its fittest, yet what a tribute here to living things, what surpassing achievement by its children. No more than a negligible and unknown band on the advancing fringe of early migration, they embodied that miracle of life in the wild—its matchless, deathless spirit.

A doe, whose story well illustrates the sustained courage that carries the four-footed and feathered kind through unmeasured trial and pain, was seen often one spring in the woods surrounding my home. She was accompanied by her twin fawns, and I saw her more frequently after the youngsters had lost their juvenile spots.

Evident in the manner of the doe, and still in early summer a grievous handicap to her, were the effects of a wound likely suffered during the preceding autumn. The marks of the gunshot yet remained on her left hind leg

THERE WERE THIRTEEN IN THE LITTLE GROUP OF HORNED LARKS THAT FED ON THE SCATTERED HAY, UNMINDFUL OF THE COLD SNOW AND RAIN AND DRIVING WIND

high on the twisted hip. She could little more than touch that foot to the ground as she went haltingly through the leafy woodland. The privations of the mother were to be seen in the smallness of the fawns, a fact apt to be overlooked as one followed the agile and mischievous frolicking of the pair.

Imagine the courage and fortitude with which this doe survived her disabling injury and the long winter of deep snows to fulfill in the spring her obligations of motherhood! Successfully she had met the many dangers to the rearing of her young and, although yet a cripple, valiantly and undismayed she was continuing their training, faithful to instinct within her.

I do not know her final fate, yet I do know that another November ended the story for the two fawns. What honors are not owing, for indeed what penalties do not come, to mothers of the wild?

The habit of "freezing" is practised by many dwellers in forest and field, especially among those pursued and preyed upon. Always I had been curious as to how long the varying hare, or snowshoe rabbit, a constant user of this ruse in his efforts to escape detection, might employ it under favorable circumstances. There is, of course, the physical limit, as where the hare may pause inactive in some pose that would test strength rather than nerves. An individual that "freezes" while erect upon the hind feet and straining for height can not be expected to maintain the position for any considerable period.

It was March and I was hurrying home from a hike in the foothills. The snow was a patchwork cover of white upon the fast-emerging floor of the woods. All the snow had vanished from beneath a clump of pine and fir, yet only because I was a short distance away did I distinguish a spot of snowy whiteness as being the motionless form of a varying hare. He was crouching beneath the butt end of a weatherbeaten log, part of which overhung, making a sort of porch in which he awaited the approaching dusk. Later, investigation with a flashlight disclosed a long and narrow tunnel running back into the decaying tree trunk, its fire-blackened and punky walls thinly lined with many white hairs worn from the soft coat of its occupant.

I had come within twenty feet before I noticed the snowshoe beside the entrance to this obscure retreat. Thinking I would pass he did not move. Here was that long-awaited meeting. The hare, clearly visible beneath the boughs overhead and between the boles of the surrounding conifers, was hunched, not uncomfortably, in a position he could hold for some time. Noting the hour by my watch I allowed myself twenty minutes, surely an ample space in which to outdo this timid woods creature.

Five minutes, then ten, and not the slightest discernible movement on the part of the white hare; no motion even of the alert, dark eye. I remained in my tracks but otherwise attempted no "freezing" of my own. Now I sat upon my heels or shifted limbs that developed unforeseen aches and stiffness. A band of chickadees and nuthatches came merrily and passed on. The sun sank low beneath a bank of clouds. A robin chirped querulously. A red squirrel tired of his own unheeded chattering. Not before twenty-three tedious minutes elapsed did I catch a suggestion of motion in the small white statue, a barely perceptible trembling of the sensitive ears.

I had extended the time to half an hour, and still it seemed that I must go without discovering the limit of the varying hare's endurance. Then, at twenty-nine minutes I witnessed its first voluntary movement—a slight hunching of the hindquarters. Two minutes later I stepped slowly toward the snowshoe, and, as though helped by a spring, he bounded into the evening shades. I had learned something more of that celebrated ability of wild things; their quality of endurance.

Six deer racing in single file up the shoulder of a ridge caught my eye just as I left cover. A second later and they would have fled unseen, for, glimpsing man, their dread enemy, they dropped quickly over the ridge. Yet when I followed their trail in the snow their tracks returned again to the summit once the forest effectively shielded their flight. They had not, surrendering to fear, dispersed panic-stricken in the opposite direction from me, but sagaciously had followed their leadership. It had led them back at the proper moment to the ridgetop, where danger from both sides might best be forestalled. How intelligently does the wild control its emotions!

It was a day in the first week of April. Late afternoon

"SIX DEER RACING IN SINGLE FILE UP THE SHOULDER OF A RIDGE CAUGHT MY EYE JUST AS I LEFT COVER"

waited to vanish only until evening had stolen near. I had come across a wide and forsaken cut-over area. The land was recovering from the logging of ten years ago, for young pine and fir now concealed many a scar upon hill and benchland. However, in all directions and grotesquely picturesque against the sky, were uncounted stubs or snags, skeletal remainders of forest ranks once standing there. Dead they might be, but vital they were to the comeback of avian life to this deserted country. Flickers and Lewis woodpeckers had returned in numbers to claim dominion, and the old snags, lifting uncouth silhouettes on every hand, were invitations to this return, for they promised acceptable homes.

Heavy, gray clouds lowered above and fast were veiling the great snowy ranges in the west. The sun sank, wet mist hung darkly in the gulches of the nearer hills, and traces of rain slanted into one's face. Yet from ahead, and again following it from my right, sounded the long, loud, staccato call of the red-shafted flicker, that wild, free, and rejoicing cry that is one note, clear, sharp, indefinitely repeated. Instantly on its cessation would come, from his acoustical limb, the performer's drumming. Since dawn routed darkness the cut-over country had rung with the courtship calls of the flickers. I had passed beyond hearing of others; as I left these two in the distance, their cries still audible, another from ahead, one below in a broad swale, and a third faintly, close by the foothills, voiced their glad celebration of spring. Not the day-long effort; not the cold gray evening, the threatened storm, nor the discouraging rain; not the blustering breaths of a wind that sprang up at intervals, nor even the chill, encircling mists, had dampened those glad, ebullient spirits.

So universal, to be sure, was the overflowing joyousness that one might have gone on across the valley land ever within hearing of that exhilarant calling. Indeed, by its spell, gray evening and chill wind and thought of hastening to shelter were forgotten. Spring for another day was not sleeping; not a hope, merely, but a reality. Now, as I tilted her chin, I saw a smile on the face of a yellow bell at my feet.

It is through their surpassing morale that wild things triumph over the but seldom mitigated harshness of their environment. By this undying, this deathless spirit of living things is expressed the most marvelous part of creation. We know that in the spirit of the wild the Creator speaks to us. How can we truly worship Him if we wantonly or heedlessly destroy and despoil the wildlife, the forests, the land and the waters which He has created?

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The February issue of Nature Magazine will contain two outstanding features of interest and permanent value. One will be the presentation of a pictorial history of the microscope, tracing its part in science, medicine and industry from the crude instruments of early days to the splendid microscopes of today. The other will be the educational insert devoted to the heavens and providing sky maps and a unique planisphere.

Shorty, the Shrew

Who is more valuable to man than most people realize

By VERNON BAILEY

OVER THE eastern half of the United States and some of southeastern Canada the short-tailed shrews are abundant and important small mammals, although they are rarely seen. We call them small, but among the shrews they are one of the largest, being about mouse size, and of sturdy build and bloodthirsty disposition.

They are burrowers and ground dwellers, keeping much under cover and out of sight. Almost mole-like in structure and habits, they have functional, although very small eyes, scarcely visible ears, short legs, short tail, and velvety fur that always keeps clean and glossy. A pointed flexible nose serves the place of eyes in dark tunnels where much of their food is gathered by sense of smell and feeling, but the pin-head eyes may be very keen in the dark at short range. Their beautiful brown-tipped teeth are effective weapons for holding, cutting and crushing their prey, most of which are insects and other small animals up to their own size or even larger.

While true insectivores and equipped with hooked incisors intended mainly for catching and holding insects and their relatives, while crushing them with the heavy molars, they are able also to kill and eat vertebrates as large as themselves.

With a simple but rapid digestive system, they are hearty feeders and full of dynamic energy, strength and activity. In a few hours one will eat its own weight in earthworms, insects or meat, and be ready for another hearty meal a little later. They sleep or rest by short intervals of an hour or so during the night and day, and eat or search for food between these short naps. They never become fat and are active throughout the year, generally working under the snow, or underground, during the winter in the North. They often come to the surface of the snow in the coldest weather, making long lines of unmistakable tracks over the surface, and then tunneling back to the earth to their regular runways, tunnels and burrows.

These winter trips are probably in search of new hunting grounds when their food supply is exhausted at home. Insects are then torpid and not moving about. Some of the small mammals are also hibernating in underground nests, and others have home nests under the snow or in the ground. These supply part of the shrew's winter food and may be found over a considerable area. It is fortunate for us that these shrews are not as big as bears or we would have to reckon with man-eaters that would know no fear or caution. Even with their present disadvantage in size they will attack a man as readily as a mouse, and if they get hold of a bare finger will quickly draw blood.

Shrews are easily handled, however, and may be kept captive for some time for study and observation. Even in such cities as the Nation's capital, sometimes in the parks or even in vacant lots, they may be caught in little tin-can or milk-bottle traps baited with rolled oats flavored with peanut butter or bacon grease.

A large glass bowl, half full of earth and covered with a wire screen, makes a good observation cage. This may be kept on a library table or desk where, by watching the shrew's activities at spare moments, one can learn much of its habits, nature and disposition. Plenty of earthworms, meal worms, fresh meat, nut meats, rolled oats, and water should be supplied and never allowed entirely to disappear, for a shrew will starve to death in a few hours. The bowl must be emptied and washed out every few days for cleanliness. Shrews have a musky odor that at times is rather strong in the adults, but is hardly noticeable in immature individuals.

Besides food and water some nest material of small flat

SHORT-TAILED SHREW AT THE ENTRANCE TO ITS BURROW
They are abundant and important animals but are not often seen

leaves should be provided. These will be carried underground and formed into a clean smooth nest ball just big enough to curl up in. Cotton, wool or any soft material will not be used for nests.

One *Blarina brevicanda*—for that is the scientific name—that I caught and kept in a large bowl in April, 1928, was well fed and contented in an outdoor room where the nights were quite cold. The next one I caught was dead in a mouse trap, so I gave it to Shorty to see if he was cannibalistic. He promptly ate it in his regular manner by cutting the skin at the back end and pulling the meat out of the skin, eating the whole body, bones and all, and leaving the skin nicely turned wrong side out. The nights were cold and I went down at bedtime to see whether Shorty had enough nest. He was not in his leaf nest on the surface. In the ground under it I found a queer object that looked like a large moth cocoon. When I touched it, it wiggled. Clearing away some of the earth I found that it was the inverted skin of the devoured shrew, with Shorty inside sleeping comfortably in a fur-lined sleeping bag. His nose peeked out of the head end of the skin and his tail stuck out of the back end. He was so warm and comfortable that he refused to come out and I found him in it again next morning. The skin had dried hard and he continued to use it for three nights and days whenever he was sleepy and as long as the cold nights lasted. Then he tore it open along the side, evidently trying to get in the wrong end, or else getting out in a hurry.

THE SHREW'S EYES ARE VERY SMALL
The pointed and flexible nose serves in the place of eyes in seeking food underground

I was afraid no one would believe me if I told this sleeping-bag story, so I asked C. Hart Merriam, Charles Sheldon and Carolyn Sheldon to examine Shorty in his sleeping bag, and I still have the torn skin that he used. Whether this is a regular winter habit with these shrews I cannot now say, but it would be natural thus to use any of the little furry animals caught for food.

Another short-tailed shrew caught in March, 1937, developed musical talent of unusual interest. He was a full-grown male as I could tell by his size and the conspicuous glandular stripes showing obliquely down both sides just back of his ribs. As usual he was an active little dynamo of energy, appetite and ferocity. Always on the go, he would bite and squeal if touched, was generally hungry and often thirsty, and insistent on frequent attention. He ate all the earthworms I could catch for him, and any insects, but was perfectly content with plenty of mealworms. These he would take from my fingers one at a time as fast as I could hand them out, and if the mealworm wasn't there he would grab a finger.

His principal accomplishment, however, was singing. If I squeaked my lips, or whistled in a high key, he would come to the door of his nest box, wiggle his nose and begin to chipper and squeak. As I led him on he would run into a long vibrating trill, high pitched and bird-like, varied and pleasing as a song. He would sometimes keep it up for a minute or more with nose elevated, mouth open and throat vibrating, with motions not unlike those of a canary.

He finally escaped from his cage and disappeared. I hope to get another and see if his musical education can be carried any further than his predecessor's.

Just why these little animals were created in great numbers over a large area of this continent is as much a mystery to us as why we were distributed over a large part of the earth's surface, but they may have an important function in the scheme of animal economy, as we think we have.

Some animals are excessively prolific, and if allowed to increase at normal rates they would destroy everything else that lived. The meadow mice are among the most prolific mammals known and for their good and ours they must be curbed in abundance. While considerably larger than these large shrews, they are a favorite prey, and where

they are numerous the shrews often are also unusually numerous.

While studying a tract of farm land near Wheeling, West Virginia, in 1926, I found both of these species abundant on the same ground in about equal numbers. I caught twenty *Microtus* on an acre and almost an equal number of *Blarina*. I put one of each alive in a cloth bag and then had to work fast to separate them before the shrew could kill the much larger mouse with a strangle hold that was hard to break.

The shrews were mostly caught in traps set across the many well-worn runways of the meadow mice which ran under the heavy layer of grass from burrow to burrow. The roadways, tunnels and burrows of the meadow mice were regular highways for the shrews, and the young mice in the nests must have been absolutely at the mercy of these merciless killers. But for the shrews there might have been ten times more of the meadow mice and then the farm crops would have suffered severely. As we all depend on the farm crops for a living these little shrews may, at times, just stand between us and starvation. Unlovable as they are, they probably have a very important place in the economy of Nature, and the more we can learn about them, the better for us.

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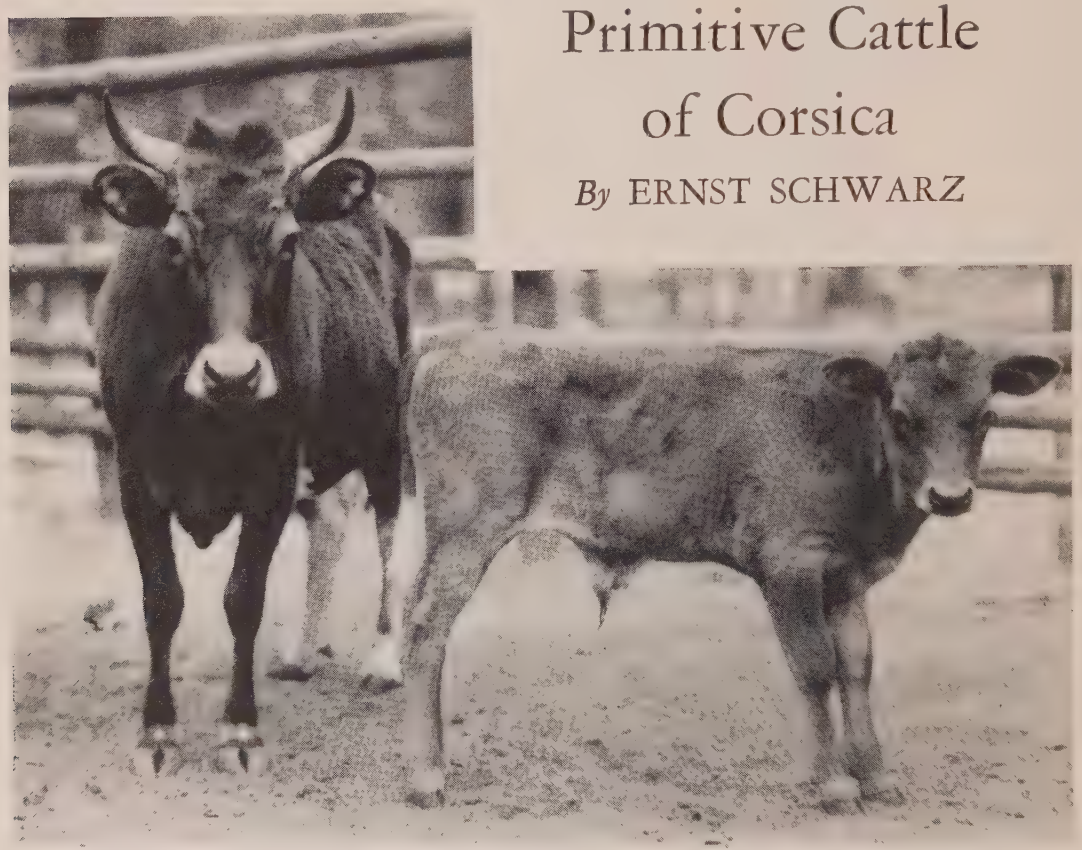
Primitive Cattle of Corsica

By ERNST SCHWARZ



ALTHOUGH the wild ancestor of our domestic cattle is well known, there is no definite record of when and where the wild bull, the aurochs, became a tame animal. While the wild pony still survives in the steppes of Mongolia, the wild bull definitely vanished from the earth some hundreds of years ago. All that remains of it are bones found in peat bogs or middens, a few drawings, and a wealth of stories, fables and songs in the ancient literature of European peoples.

A few years ago Dr. Lutz Heck, Director of the Berlin Zoo, and his brother Heinz tried to reconstruct the old aurochs. They realized that most of the more striking characteristics of the wild bull were still found in domestic cattle, but that, by artificial selection, some were retained in one and some in another breed. Therefore, by crossing various breeds, and by consequent elimination and recombination, they succeeded in re-establishing a type of bull similar to the one found in Herberstein's historic drawings. The younger brother, Heinz, got what he wanted by random crossing; the elder, Lutz, worked with primitive breeds that he hunted up in various corners of Europe. One of the most interesting of these is the breed that has survived in the island of Corsica in the Mediterranean, and which has retained all of the more conspicuous features of its wild ancestor. The bull is black on the flanks, reddish on the back, with a buffy median stripe along the spine, and with a white band around the muzzle; the cow and calf are dull red all over. These animals differ from the original wild bull only in size and the shortness of their horns.

PORTRAIT OF A POISONOUS PARAPONERA ANT

HOW THIS JUNGLE ANT MUST APPEAR TO PREY

Black Demons of the Jungle

By PAUL A. ZAHL and CARYL P. HASKINS

WE HAD arrived on the New York pier with, we think, as quaint a collection of baggage as ever irritated a customs inspector. There were strange boxes with conspicuous "Warning" labels; fish cans not containing fish; camera cases; nets, steel cases and other gadgets that inspired passers-by to give us skeptical looks.

After the usual confusion and delay an inspector was assigned us.

"What's in that?" he began, without introduction and pointing at one of the most weird of the boxes.

"Ponerine ants," was the meek reply.

"What?"

"Live Ponerine ants," a little less meekly.

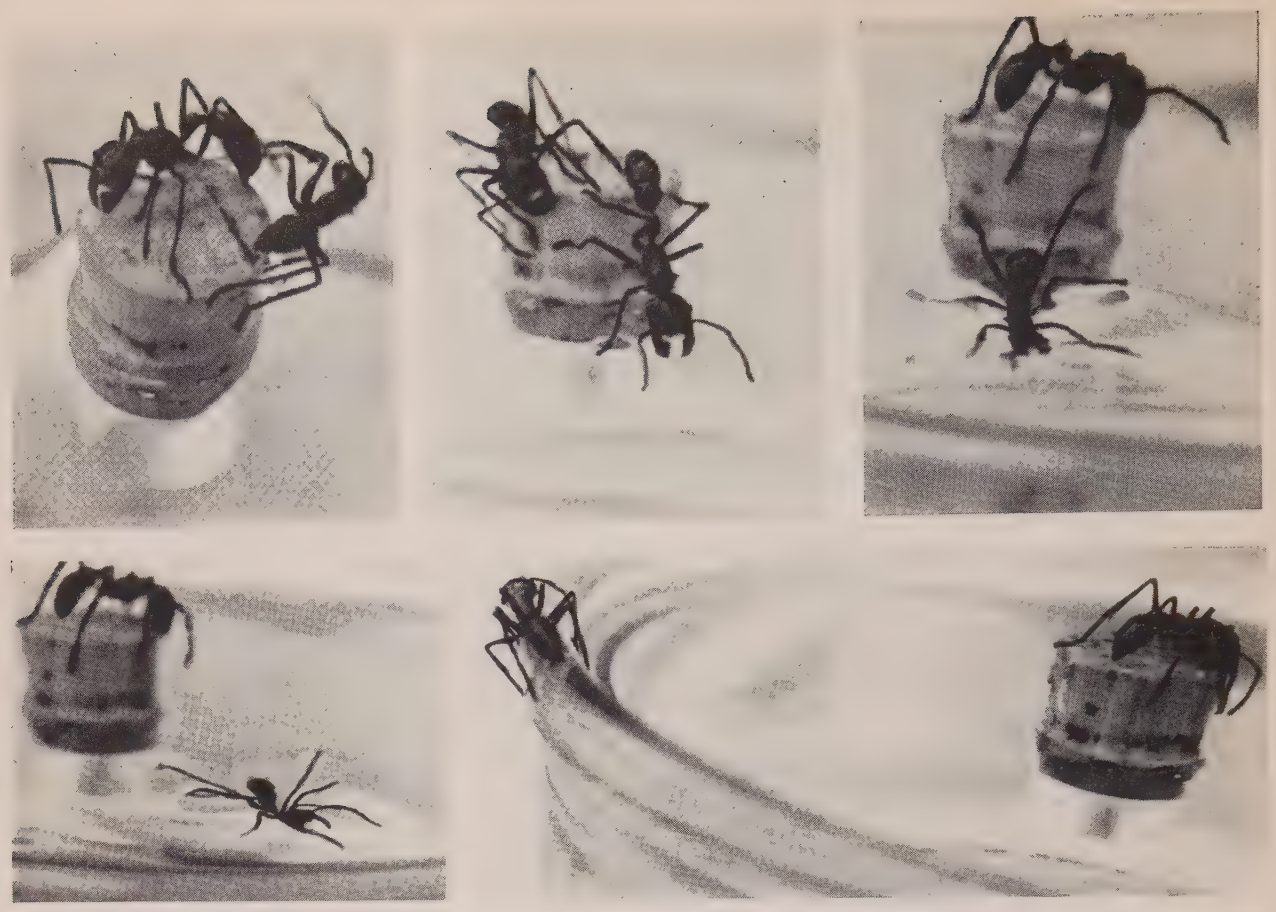
"Ants?" he gasped incredulously, and eyed us with suspicion from head to foot. Then more gently, "What are you bringing ants in for? Where did you get them?"

By this time we had dug out letters and permits from the United States Department of Agriculture legalizing entry of our exotic ants. The inspector scanned them, but had not recovered fully from the stunning blow received from finding someone bringing in *live ants*. He called the chief inspector. The latter, it seems, had been warned of our intention to arrive with a consignment of live poisonous ants, and since our permits were in order allowed us to go through without further ado. We now breathed freely.

What had bothered the first inspector was probably the fact that he did not recognize either of us as Frank Buck, and that there were no circus or zoo labels on our boxes. We looked like ordinary people, and since ordinary people do not travel around in the company of ants—the obvious corollary was that we were crazy.

Neither of us denies that we are crazy—who can—, but we do insist that the possession of ant colonies on a New York pier in no way reflects a questionable mental condition. Indeed the fact that we had live ants on the New York pier was to us no small triumph. The rather inaccessible tropical species confined in our boxes we knew to be of unique significance to certain members of the scientific world. Men had tried to transport them from their jungle habitats to laboratories in the States, but without success. That we had arrived with our colonies in good condition so elated us that any aspersions on the part of the customs inspector or John Public seemed like delicate compliments.

We had left New York six weeks earlier, bound for Panamanian jungles in search of ants. But not *any* ants, understand. Of the hundreds of species so ubiquitous in the tropics we had to seek out a particular genus known



THE ANTS' SWIMMING ABILITY WAS TESTED BY PLACING SOME ON A CORK FLOATING IN A JAR OF WATER
They shuffled about and investigated. Then one ant touched the water. It felt all right. In she dived, as gracefully as a six-legged creature can manage, came to the surface, paddled for the rim, and climbed safely "ashore"

as *Paraponera*. This genus belongs to a group known as the Ponerine ants, and, from an evolutionary point of view, represents one of the most primitive and least specialized of the ants. Yet, strangely, very little is known of the life cycle or habits of *Paraponera*. The late Professor W. M. Wheeler, speaking of the large Ponerine ants, stated some years ago: "Our knowledge of the habits of these remarkable insects is still imperfect and conflicting for they bite and sting with such ferocity that few observers have cared to study them at close quarters."

Our ambition was to bring a colony of living *Paraponera* back to the States. Yet we knew that others had tried it without success. But our first worry in the jungles was to locate and collect the ants and to study their habits.

Our first question was: How would we recognize them? Well, the most conspicuous character of these ants is their comparatively enormous size—varying from three-fourths to more than an inch in length. In point of view of size they are to the ordinary ant what the horse is to the dog. They are brown-black in color with small bead-like eyes and disproportionately large and formidable mandibles. And, of course, there are the technical anatomical peculiarities in which only the myrmecologist is interested. Very important, too, from the standpoint of the collector's health, is the extreme severity of their sting. In Peru they are spoken of as the "four-sting ant", implying that the combined stings of four ants are lethal to the human organism. Not only is the alkaloid that constitutes the venom extremely toxic, but the apparatus for injection of the venom is most efficient. We can speak from personal experience.

The ants are more or less inactive during the day, but under cover of darkness they sally forth singly or in loose columns on foraging expeditions. The colonies, large and untidy and featured by the loosely-piled soil about their entrances, are to be found scattered through the jungle at the bases of hardwood trees. To locate a nest one wanders through the jungle until he finds a lone foraging individual and then patiently and tediously follows this ant until it returns to its colonial nest.

So we undertook our search for *Paraponera* at night. The jungles of Central America at night, as revealed by our powerful flashlight, take on all the color and form, and ethereal mystic beauty of a garden of the *Arabian Nights*. The last streaks of sunset had been greeted with the booming and rumbling roar of sleepy colonies of howler monkeys preparing for bed high in the blackening treetops. The power-house hum of great cicadas in nearby trees, rising and falling with a rhythmic cadence, which was at first startling and finally maddening, was stilled, and the silence that took its place merged with the greater silence of the now black jungle, lulled into quietness when the creatures of the day had gone to rest, and the night wanderers were not yet ready to sally forth. Twilight is the neutral ground of the jungle, when only a few wayfarers, and these relatively inconspicuous, are

abroad. Bats played above rising clouds of gnats and midges, and the desolate falling hoots and whistles of owls, nightjars, tree frogs and sleepy toucans alone broke the stillness. Then, as tapir and puma, ocelot and white-lipped peccary stepped on the scene, and as an incredibly round orange moon arose mysteriously from Gatun Lake, leaving a widening trail of molten silver, the night was really upon us.

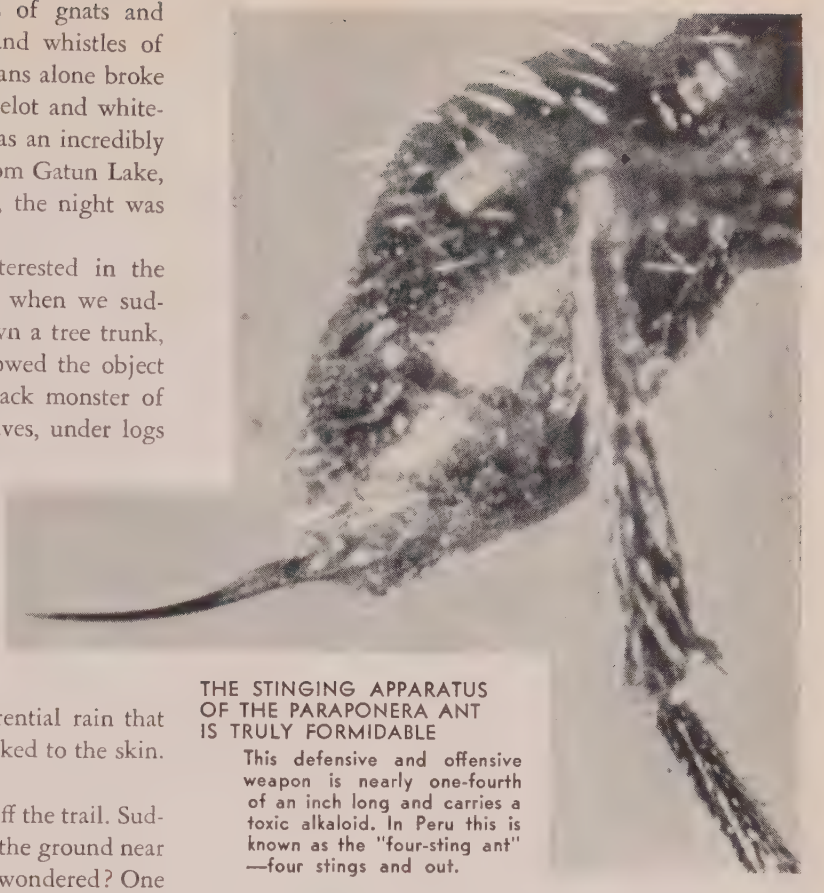
We were not, however, primarily interested in the acoustics or mysteries of the jungle, and when we suddenly spied a *Paraponera* ant coming down a tree trunk, we forgot the jungle symphony and followed the object of our quest. Quickly and quietly the black monster of an ant moved—under leaves and over leaves, under logs and over logs. We knew that she was nest-bound, for vised in her jaws was a helpless caterpillar. She was bent on supplying the larval ants in her colony with fresh meat. So we followed, brushing aside palm fronds and entangling vines, and oblivious to the possibility of palm viper or fer de lance. We were almost unaware of a torrential rain that was now descending and that we were soaked to the skin. We saw only our ant.

An hour passed, perhaps. We were far off the trail. Suddenly our ant disappeared into a crevice in the ground near a small sapling. Was this hole the nest, we wondered? One of us struck the tree trunk sharply. The spot of our flashlight played on the small gaping crevice. We struck the tree again. Suddenly from the crevice erupted a geyser of fierce, living black things avid to fasten onto the first object they encountered; to bite, to sting, to kill. We had found our first colony of *Paraponera!*

One of us held the flashlight while the other approached the nest. His weapons of aggression were nothing more than a heavy pair of forceps and a large Ehrlenmeyer flask. These ants are very heavily chitinized, or hard-shelled, so one may pick them up with forceps without liability of injury either to the ant or to the invading creature at the other end of the forceps. The light blinded and infuriated the ants, and one of us set about carefully picking up individuals and quickly transferring them to the glass flask.

Of course, one was poignantly aware of the delights of being stung by these ants, so he watched not only his forceps, but also his trousers. These *Paraponera* are remarkably quick on their feet and if one did not move often and quickly after disturbing the nest he was apt to find what the poets of Tin Pan Alley call ants in his pants. And when *Paraponera* get into your pants—well, that's bad!

While thus working on the *Paraponera* nest one of us inadvertently got too close to an angry worker. There was a quick thrust of the ant's abdomen and—zowie—a quarter inch of sting was buried in the soft tissue of a human finger. Reflexes, of course, worked fast, but not before a nice load of toxic alkaloid was deposited under the skin. The pain was severe but did not seem to localize itself at the site of injection. The entire hand began to pulsate. Then the numb sort of pain began to move up the arm.



THE STINGING APPARATUS OF THE PARAPONERA ANT IS TRULY FORMIDABLE

This defensive and offensive weapon is nearly one-fourth of an inch long and carries a toxic alkaloid. In Peru this is known as the "four-sting ant" —four stings and out.

There was a great deal of expressive arm movement and pacing up and down the trail. One felt vicariously that the roar of the howler monkeys at this time was appropriate. The pain moved up the arm as far as the axillary region. The axillary lymph nodes began to swell and were pulsating fiercely. This condition continued for more than an hour and then began slowly to wear off. Maybe there is something to this Peruvian "four-sting" story. On the other hand, we have reason to suppose that the severity of the *Paraponera* sting is conditioned by a sort of allergic (to use the term loosely) sensitivity, which may vary in different individuals. One of us has received numerous stings without the appearance of lethal symptoms. The other of us seems particularly sensitive to the *Paraponera* alkaloid. It seems quite possible that if four ants deposited their toxic loads in a highly vascular region and if the victim were particularly sensitive to the alkaloid, death would result. After a few such encounters with the *Paraponera* hypodermic we developed a high degree of wariness and were fairly successful in retaining an effective space between the ants and our own skin.

Except for this one adverse experience, we returned safely to camp at daybreak with a hundred or so angry *Paraponera* in our flask. We hastily shook our booty into a screen box partly filled with soil. The lid was quickly placed on the box and we yawned and stretched, somewhat relieved. Maybe we were a little tired. Dawn was breaking over Gatun Lake, and a couple of hours of sleep seemed welcome before breakfast. One dropped on his cot and dreamed wild dreams of monsters with animal bodies and ant heads, which emitted strange howlings.

Nature Calling

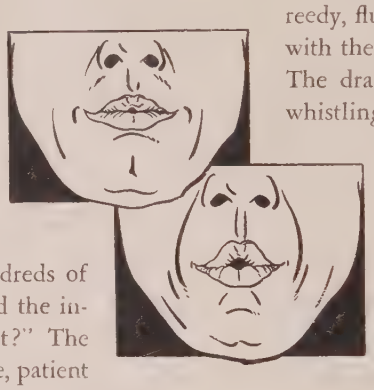
Some suggestions on how you can imitate some of the calls and songs of the wild

By ELLSWORTH JAEGER

Illustrated by the Author

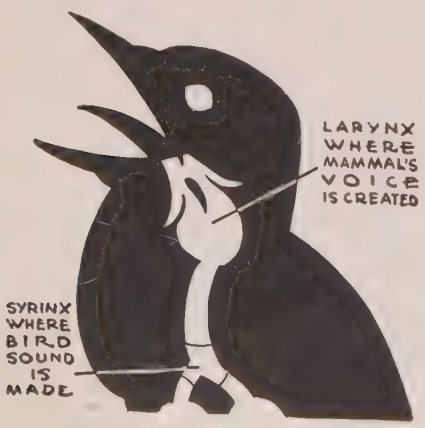
THE "hearing ear" is again becoming an increasingly important instrument, since the radio and sound-recording have given us broadcasting and audible motion pictures. We now have elaborate mechanisms for recording, but human beings are still fascinated by the ability to imitate various sounds themselves. In so doing they test hearing ability as well as ingenuity in reproducing, with throat equipment alone, the wide variety of things audible.

Three centuries ago the voices of Nature's children were well known to most Americans. Ability to imitate them was a common accomplishment. In those days it was necessary to call birds and mammals when stalking them in the hunt, as well as to use their voices as signals in Indian warfare. Today, however, this ability has become so relatively rare that it is a subject for the lecture platform. Even the most sophisticated listeners get an instinctive thrill when the voice of the owl, loon or wolf jogs their ancestral memories.



I have brought Nature's voices to hundreds of thousands in this country and Canada and the invariable question is: "How do you do it?" The answer is, by years of wilderness experience, patient stalking, and, perhaps one of the most important things of all, being a good listener. The most puzzling difficulty at times is to reproduce the sound you have heard with your own sound-making equipment. The woodland voice may have been created in a throat structure quite different from man's.

"Sing like a bird" may be a poetic description of a human's voice accomplishment, but it could never be true physically, for our voice, and all mammals', originates in the larynx—in the upper part of the windpipe—while the bird's voice is made in the syrinx at the lower end of the trachea, usually where it divides into the bronchial tubes. Here are membranes that vibrate as the human vocal cords do. The songs are created by the passing of air over the membranes, causing them to vibrate. The rapidity of the vibration and the resulting sounds are controlled by the muscles around the syrinx. The song birds may have from five to seven pairs of these muscles; other birds have fewer. The larynx, tongue, or other organs of the bird help to change the quality of the sound. Male ducks have a strange swelling at the base of the windpipe, which acts as a resonator.



Usually humans who imitate ordinary bird songs—the reedy, flute-like whistles—must create these sounds with their lips, since they do not possess a syrinx. The drawing shows the position of the lips for whistling high, reedy calls like those of the white-throated sparrow, the chickadee, the wood pewee, the osprey, and others. There is, perhaps, no sound in Nature more suggestive of the North than the sweet, pure whistle of the white-throat. To me its plaintive sweetness always conjures a picture of balsam and pine with the sparkle of sunlit lake and tumbling stream, and perhaps a wooded hill rising in the background.

When he goes South in his fall migration this bird's song is said to be "Old Sam Peabody, Peabody, Peabody, Peabody". When he crosses the border into Canada, however, the Canadians say his theme song is "Oh! Sweet Canada, Canada, Canada, Canada". So elfin and flutelike are the notes that one expects to discover at any moment a musical sprite seated astride a twig, breathing its very soul into its tiny flute.

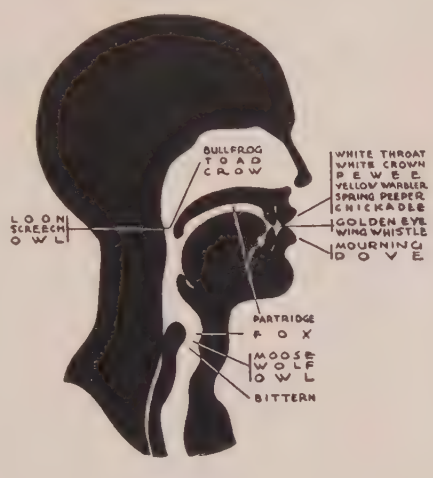
Another bird song that can be created by the same lip arrangement as in the white-throat's song are the three sad, sweet notes of the wood pewee. Three simple notes, yet in them is the hushed murmur of hidden brooklets, the slanting shafts of golden sunlight where all is dark and green and cool, mossy logs and delicate nodding woods flowers. When we hear this music, we know it is the voice of the wood pewee, for he clearly chants: "Pee-ah-wee". Even when the heat of summer silences most of the forest symphony, he still shyly sings.

The yellow warbler's song may be whistled by the same lip arrangement. When he sings his "Sweet, Sweet, Sweet, S-s-s-s-s-So, Sweet", he is evidently telling the world of his demure little wife. That he stutters occasionally does not seem to bother him, for he repeats his praises of her

charms time and again. The so-called "phoebe" song of the chickadee is easily reproduced by the same thin whistle. It is composed of only two long notes made as in the preceding calls.

You can imitate not only many of the bird voices with this lip arrangement, but you can reproduce the shrill piping of the spring peeper, *Hyla crucifer,* as well. His shrill "pee-eep" can easily be imitated. This little fellow, no larger than a man's thumb nail, is a good Scotchman, for he wears the cross of St. Andrew upon his back and plays the bagpipes by blowing up his throat like a balloon.

In giving the mourning dove imitation, the opening of the lips is greater and the cheeks are drawn taut, making a sounding box inside the mouth. This gives the mournful quality to the whistle. To hear the mourning dove sing his sad love song makes one think that he is mourning the loss of his mate rather than serenading her with a refrain of love. His melancholy "coos" sound as if he were blowing down a tube or bottle. The sorrowful tones can almost be approximated in this way. His lament may be worded as, "Coo-oo-ah——coo-oo————coo-oo—coo-oo". At times the first part, "coo-oo-ah", seems to be omitted, or is given so softly that it passes unheard. There are defined intervals between each "coo-oo", but there is a longer pause between the second and the third cooing notes.



A number of woodfolk voices can be reproduced by making a sound with the regular voice and vibrating the soft palate at the same time. The bullfrog is one of these. The first part of the song, a deep cello-like bass note, is made by vibrating the soft palate with the mouth open wide. For the last half the mouth is closed, muffling the sound like a stop on an organ. In this way his "Jug-r-r-r-Rum" song may be easily broadcast.

The voice of his cousin, the toad, can also be reproduced by vibrating the soft palate. His spring love song is a series of trills in a high key. This the toad makes by blowing his throat up into a balloon, like that of the spring peeper's. The variations of the high notes are made by the human imitator with the throat and vocal cords, while the trill is made entirely with the soft palate.

Another woodland voice, entirely different from any of these, is made in the same way except for different tones. This is the cawing of the crow. The cawing notes are made in the throat box, but the vibrating palate softens the tones to the proper crow quality. Since the crow has one of the best bird vocabularies, his voice often expresses varying emotions. Both animals and birds express their emotions well. Often in their voices can be distinguished love, hate, fear, hunger and even loneliness.

The wild laughter of the loon is one of this bird's best known vocal attempts, but it is only one of his many calls. Human beings can imitate it by opening the mouth wide, constricting the throat to create very high laughing notes and vibrating the palate more slowly than in the toad song. Sometimes the forest solitudes become articulate with the loon's wild halloos, seeming to express despair and loneliness, a sort of "oooooo-o-yooooooooo", the middle note being slurred as in Swiss yodeling. Often his shrieks echo from crag to crag, and lake to lake. At times he has a soft "whoooo-o-o-o-o", that seems especially reassuring to baby loons. When migrating, his crazy chuckles may be heard high in the night sky.

The screech owl's voice is mimicked almost in the same way as that of the loon's. The throat voice is softer and the cooing with the soft palate vibration does not come in until the latter half of the song, a sort of a drawn out "ooooooooooooo" and then the palate accompaniment, the "hoo-hoo-hoo-hoo-hoo". Why the screech owl was ever so named is a mystery to many, for his usual song is anything but a screech. To me it is an especially fitting musical accompaniment to the melancholy of fall.

The clucking of the mother partridge (ruffed grouse) sounds not unlike mother hen's voice, except that her voice is pitched higher and the rhythm is much slower. The nearest suggestion I can give to reproduce this sound is slowly to say "dook—dook—dook—dook" in a high-pitched voice, opening the mouth slightly at the end of each cluck to let the air escape. The tongue must be brought into use in this call to make the clucking note.

The marsh is a place of strange sounds, yet none are more unusual than that of the bittern in the spring. To me it sounds exactly like an ancient wooden pump in need of priming. A hollow, resonant "unka—la—plunk" is, perhaps, the best translation it can be given in writing. As a

preliminary rite to the call, the bittern stretches his head forward, opens his bill wide and gulps down air. At each swallow he snaps his bill shut. He may do this five or six times. After repeated swallowings, a swelling develops and looks as if the bird had an orange lodged in his throat. With a great contortion the swelling moves downward and then the pumping sound takes place. A bittern, thus performing, seems to be in great distress. It was once thought that the bittern swallowed water and then ejected it in making the sound. This is not so; it is evidently the pocket of air that makes the sound possible. The human throat can best simulate these tones by constricting the throat muscles, the mouth closed tightly, and saying as best you can, "unka-la-plunk", away down deep in the throat.

That music has wings is true, especially where the wings of the golden-eyed duck are concerned. This duck is called the "whistler" because of the whistling music of his wings. The air, rushing through the spread primary feathers as they fan the air with downward swoops, produces the whistling. Even at a distance of several hundred yards, the lisping, whistling swish of his wings can easily be heard. An imitation of this wing music can be achieved by hissing "see—see—see—see—see—see" through the teeth in the fast rhythm of a duck's wing-beat.

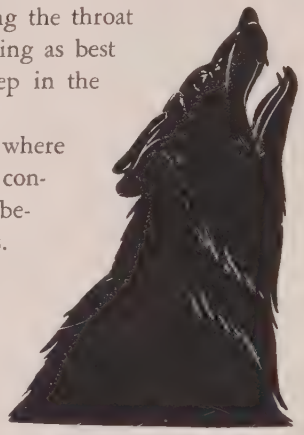
The muskrat has various ways of making himself understood by his fellows. In time of danger he may make an alarm splash. At other times he may squeal loudly, or snarl, to show his displeasure. One of his most common bits of conversation, however, is a low squeak—a friendly call to his mate. This sound is made by sucking the back of your hand. The Indians have often used this method to attract muskrats in order to capture them.

Those who listen with the hearing ear in the night woods are always rewarded by the myriad voices of the wilderness. To sit in the calm quiet of a primeval forest, so much a part of it that the woodfolk announce their presence to you, is an experience everyone should have.

To hear your first barking of a fox is a thrill, that is, if you know what it is. To city ears it may sound like the yapping of a young dog learning to bark. The male fox's bark is coarser and has more volume than the female's. The female's squalls remind you somewhat of the squawk of a blue heron. To yap like a female it will be necessary to inhale while you are barking, instead of exhaling. The throat should be constricted to give a high, rasping pitch to the "yap—yap-yap-yap-yur-r-r-r-r".

No one who has fallen under the spell of the wolf song will ever forget its wild freedom. There is a magic quality of wild Nature in the wolf's voice. When you walk in the night woods and the long, smooth, eerie howl comes echoing over forest ridges, it will send tiny shivers up and down your spine. This is the rallying cry, telling the family that "soup is on". It begins not unlike the throaty hoot of a great horned owl. The song of the hunt is higher pitched and vibrates on two notes, powerful and far reaching. Another wolf musical arrangement is the closing-in cry, a combination of short barks and howls, in which the whole pack participates. This sounds not unlike a dog fight in the back alley.

The wolf howl can be reproduced by raising the head to elongate the throat, as the wolf does when calling. This enables one to make a smooth howl. The jaws are slightly opened, drawing the skin of the cheeks tight and creating a hollow within the mouth for resonance and for amplifying the sound. The lips are opened only slightly. The throat, too, is constricted to create the long smooth "ooooooooo-ooooooooooooo-ooooooooo".



The hooting of the great horned owl is done in the same manner. The tones are almost identical, but the rhythm and intervals are of course entirely different. The horned owl seems to say, "Whooo———— whooo————whoo—whoo———— whooo————whooooo"—a deep, throaty tone made far down in the throat.

Moose calling is an art that was practiced first by the Indian hunter. Fortunately this betrayal of the lordly monarch can be done only during the fall mating season. At that time a bull moose may be lured close to the caller by singing like a cow moose in love. To do this a megaphone of birchbark, about eighteen inches long, may be made. The mouth-piece opening is about three-quarters of an inch in diameter and the larger end of the horn about five inches.

In calling no two experts are alike, yet each may be equally effective. A common cow moose song is the questioning call, "Eeeeeeeeeee-ooooooooooooo-yuh", beginning with a fine, whining note, gathering in throaty volume and expelling the end of the breath with an abrupt bellow.

The bull often answers with a grunt, that can be best expressed in writing as "OO-wuh". At times, slashing the brush with a stick will bring the bull.

These suggestions are not made with the expectation of the reader becoming an imitator of wilderness calls. We will have served our purpose if we simply draw attention to the great forest symphony of Nature, where every squeak, bark, hoot, howl or rustling lends itself to that magnificent presentation. It is hoped that when one next sits in the night woods and the tense stillness vibrates with that ecstasy of this vast harmony, that one will have a feeling of kinship with the wild, knowing that he is listening, perhaps, to the music of the infinite.

A Philosophy of the Wild

Much may be learned from Ah-meek, Indian of the old school

By TONY LASCELLES

"AND THEY THOUGHT I WAS AN IGNORANT SAVAGE"

IT WAS Ah-meek who taught me much of what I know about the wilderness. It was he who gave me my initiation into the mysteries of the Brotherhood of the Wild. It was his philosophy that caused me to wonder at the indifference of civilization toward the silent places and wild things and the race to which he belonged.

Ah-meek was an Indian of the old school who drummed and chanted when the moon was full to supplicate the aid of Manitou, The Good Spirit, on behalf of his suffering people; a pagan who refused to enter the white man's fold to be shorn of ancient customs and beliefs. He has been gone these many years to a valley beyond the setting sun from which there is no return; a valley where the smoke of many tepee fires curls lazily to the sky and game is plentiful to supply the needs of other red men who have crossed the Great Divide.

Ah-meek believed that the white man is the most destructive agency that exists, destroying the wilderness and its inhabitants for pleasure or selfish gain without thought of tomorrow and many generations to come. He had experienced the appropriation of territory that for centuries had been the home and "bread" of his people. He had seen the glow of countless forest fires carelessly set by his white brethren and countless acres of dead and naked timber left in condemnation when the flames had passed. He had experienced the pangs of hunger and poverty in a land that Manitou had favored and decreed should generously provide until the end of time. Diseases, of a kind unknown before civilization came to ravage and destroy in the name of friendly commerce, had racked his body and shut the light from his eyes; diseases that carried away the members of his tribe like autumn leaves before a blustery wind. And because of this, and other things, Ah-meek had remained a pagan, preferring the creed of Manitou to the dictates of Christianity, a creed laid down for the guidance of the Indian people more moons ago than there are needles on the branch of a pine tree; a creed from which we can learn much that is good and little that is evil.

Ah-meek believed, as did others of his kind uncontaminated by the influence of the white man, that he was an integral part of the wilderness in which he lived, a cog in the ever-turning wheel of life. He killed, like the other flesh-eaters who shared his domain, without malice or pride, with apologies for a deed born of compulsion. To the moose he would say, in an undertone, before his rifle spoke: "Brother moose, I am sorry to take your life but I need your flesh for food and your hide for clothing. It is your turn to die; some day it will be mine." To the frozen body of a varying hare pinned beneath a deadfall, he had a word of sympathy, believing it was just and right to offer an explanation regarding its earthly demise. Even to the wolverine, "Robber of the Woods", something must be said in extenuation when it died at his hands. The tenets of his abiding faith decreed that the slaughter of any form of wild life must be justified and purposeful in accordance with natural laws. Moose and mouse and the feathered folk of the forest and marsh were spiritually as one in the eyes of Manitou. He believed, too, that every living thing had a duty to perform for the benefit of the whole, and that human beings, irrespective of race and creed, were no exception to an inexorable law of Nature interwoven in the fabric of all affairs. He knew the cycles of population abundance and depression of the creatures upon whose lives he and his tribe once entirely depended for a livelihood and a measure of happiness to salve the trials and tribulations of a primitive existence, and killed accordingly, until compelled by the greed of the white man to scramble for the crumbs. Ah-meek, indeed, was

altruistic, a virtue whose worth we have not yet learned to appreciate in our prosecution of wilderness affairs; a virtue we will never acquire until human arrogance and a conceited desire to occupy a self-appointed place in the sun gives way to a knowledge that, in the scheme of things, we are but an inconsequential part of a more glorious remainder.

And, in keeping with these beliefs, Ah-meek abhorred cruelty in the accepted sense of the word. He disdained to employ the conventional steel trap for the taking of fur-bearers. He preferred the deadfall and other simple contrivances in common use before Newhouse launched his metal gin on the seas of barbarism, contrivances that kill without undue suffering and the possibility of escape with maimed and lacerated limbs. Nor was he an exception among his people, for others of his age and creed subscribed to the same code of ethics in relation to the animal people of the wild, even as many do today. Moreover, Ah-meek killed cleanly the creatures whose flesh he ate. He killed at close quarters, to be sure, for long-distance marksmanship had no appeal and gave way to the exercise of a superb knowledge of woodcraft, unknown to the majority of white men who invade the woods to destroy and injure in the name of sport.

Because he was a part of the wilderness in which he lived, Ah-meek believed that the destiny of the red man and his environment was beyond the present understanding of the white race, whose officials, through inexperience, should have no seat in the Indian council of wilderness affairs. Experience had taught him that educating the Indian beyond the necessity of simple learning, the desire to destroy the Indian mode of life and the insistence that they exchange their ancient form of worship for the tenets of a religion they can neither apply nor understand, would result in the ultimate destruction of the Indian people as a race. He believed that the large tracts of forest, which for centuries had provided his tribe with a livelihood, should be relieved of the burden of outside exploitation, in order to avoid the necessity of government relief in the matter of food, clothing and other necessities which an unexploited and recovered wilderness could well supply, and also restore individual initiative and pride. An Indian should be an Indian, with all the glories and perquisites of his ancient past, until the end of time.

This, in the main, was the philosophy of Ah-meek, the philosophy of one of Nature's gentlemen whose unsophistication and wisdom is refreshing to remember in a greedy, over-stimulated age; a philosophy to which all who know the wilderness, the Indian people and the wild inhabitants who share their domain, will subscribe.

It is with regret that we witness the passing of a generation of red men who could, had their protesting voices been heard above the clamor for gold, have preserved their environment, their people, and the creatures of the forests in which they lived, creatures whose numbers measured the distance between prosperity and distress. Perhaps, though, it is not too late to profit from a philosophy in dire need of appreciation. It may help us to understand ourselves and our attitude toward the silent places and wild things and the race to which Ah-meek belonged. And understand we must, before it is too late.

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Rape of the Land

By GRETA GRATZ

The naked land rose dripping from the sea
And gulped great drafts of the encircling air;
While sunlight, glinting on her rocky breast,
Made rainbow'd patterns through the changing mist.
Millenniums passed like minutes on the dial of time;
Air, water, sunlight, heat and cold
Cracked her stony visage—made it soft;
Made her body fertile for all growing things;
And Life, beginning who knows where,
Laid down the magic mixture of its source
And gave as heritage to living things—the age-less soil!

Sublime and fertile continent, marching proudly from the sea!

Then rose the primal forests, dim-aisled and majestic,
Limned against the heavens in unbroken, far-flung stretches;
Sweeping downward to the grasslands,
Plains and prairies, where the bison's
Thundrous poundings sent the echoes
Through the multicolored canyons.
Here the wild geese drove their wedges
Over well-marked ancient flyways.
Here with airy grace, the horned goat
Clung to edges of eternity.
Here the waters in willowed swamplands
Singing over pebbly brookways,
Plunging over precipices,
Roaring tumultuous at floodtide,
Gave the continent its life-stream.

Rainwashed, sunkissed, windswept, growing, creeping to the sea!

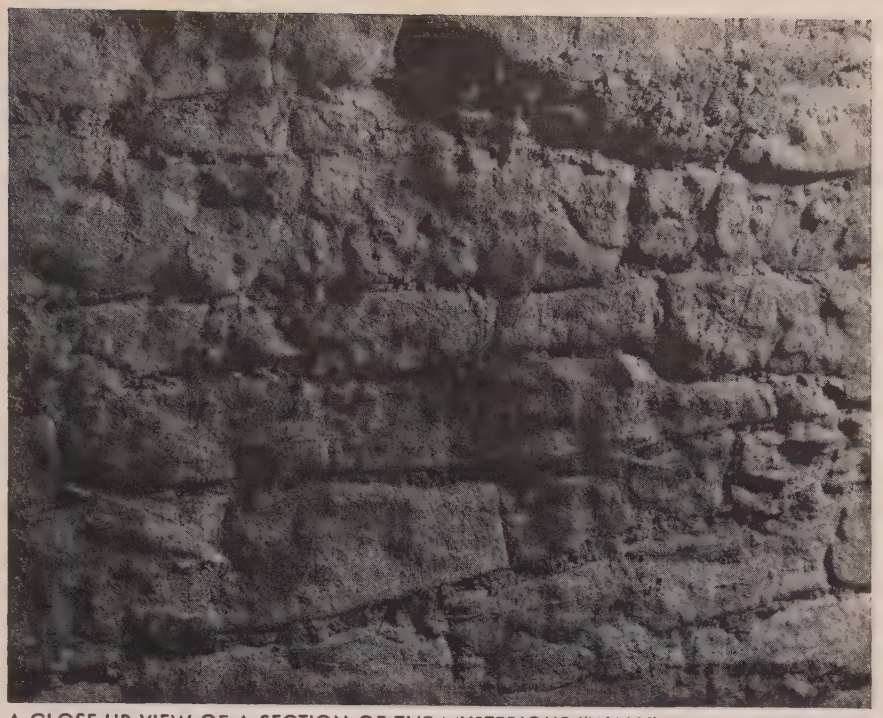
Now rose the roaring din of man-made things,
Displacing God's own murmurings;
The forests stripped, the waters fouled,
The grasses dead, the soil defiled;
A vital land's fertility
Reduced to stark sterility!
There is NOTHING beyond the horizon
For men who CANNOT SEE!

Blowing, flowing, the anchor-less living earth
Runs bleeding back to the sea!

The Mystery of the "Wall"

By GRETCHEN HOWELL

Photographs by John Gould Blacklock



A CLOSE-UP VIEW OF A SECTION OF THE MYSTERIOUS "WALL"
This graphically explains why people attribute this formation to human hands, for the sand in the cracks appears like mortar

A ROCK WALL suggests New England countrysides, the Great Wall of China, or an impenetrable castle on the Rhine. To people of various places it may mean different things. To residents of Texas, particularly northeastern Texas, it means a peculiar formation located in Rockwall County twenty-five miles northeast of Dallas.

Interest in this formation of rock continues at an even tenor most of the time, with an occasional flare-up when some geologist or archeologist visits the site and makes a statement. During the past ten years nothing much has been done to revive interest. However, the Texas Centennial in 1936, and the Greater Texas and Pan American Exposition in 1937, have brought many people to Texas over the Bankhead Highway that passes through the town of Rockwall. Hundreds of these people have stopped to see the "wall" and are no doubt telling their neighbors and friends about it.

As has been the case since the "wall" was discovered, there are two schools of opinion—those who believe the formation is man-made and those who think it is a work of Nature. Those who favor the man-made theory range from people of simple faith to those who believe that they have proof for their theories.

On the one hand is the man who once said, "Sure it's made by man. God does wonderful things, but He never put that mortar betwixt them rocks." Another cited the fact that there is not a rock like the ones in the wall for two hundred miles. He pointed to the masonry and asked, "Don't that look like the work of man?" He then told of the wall being four miles square with abutments on the inside and a perpendicular outside face. All of this leads to speculation as to how the rocks were moved there and why, when and by whom they were moved if they were not formed by Nature. To this, of course, comes no answer.

Naturally, legends made their appearance early in the history of this discovery. Many people believe that there is a buried civilization within the wall, perhaps a great treasure. This story is said to have come from an early-day miner of another state after he had explored the "wall". Some people think that the rocks were carried by boat from a distant place when the site was a sea. Others believe the rock to be made of adobe which the pressure of the earth has compressed to its present state. They think that this was done perhaps hundreds of years ago.

On the other hand, there is the Nature theory, which at least one archeologist has discounted. Nevertheless, this theory is substantiated by the fact that formations of this kind, while rare, have been found in other parts of the world. Science calls them "dykes" or "dikes". One such structure is found in California, another in Georgia, and still another in South Dakota.

Geologists explain the "dyke" by showing how it is possible for sandstone to be made into rock by the action of water or heat. Here again there is disagreement. Some geologists say that the stones are most certainly not igneous, that is, formed by heat. They think that sand, water and pressure have united to produce the structure that the layman calls a "wall". In either case they agree that some sort of a disturbance caused the stones to crack and that the mortar-like substance was probably deposited after the upheaval as a tendency of Nature to repair the cracks.

The "wall" at Rockwall, regardless of theories, is an interesting formation. It appears at intervals over the county and in a part of the county to the north. It was discovered when the first town well was dug. There are definite corners to the structure, but there are many angles,

also. Moreover, the depth has not yet been determined; while the width varies from one to fifteen inches. Since the height is known to be at least forty feet, it seems unlikely that it could ever have been a wall and remain standing or offer substantial protection. Nevertheless, many people who see the "wall" believe that "injuns" built it. One man has claimed to have discovered a perfect arch. The surface in many places seems to have been plastered with a smooth substance.

Interest was keenest in the formation during 1925 when Count Byron Kuhn de Prorok visited it and declared it a phenomenon much like work he had unearthed in Carthage. A well-known publisher in Texas, Colonel Frank P. Holland, financed excavations during that year. These were in charge of two University of Texas professors, Drs. J. E. Pearce and L. T. Patton. The results of this investigation and exploration received wide publicity at the time, and much interest was aroused. Dr. J. Fewkes, Chief of the Bureau of American Ethnology, had also visited the site. He concurred with the University of Texas men in the belief that the structure is a sand dyke.

A sand dyke is formed in a fissure of the ground by one of two methods. The sand may be forced up from beneath, or it may enter the fissure from above. The openings in the earth may be the result of various forces such as earthquake shocks or the leaching out of some of the soil, leaving cracks. The source of the sand and how it gets into the fissure is another problem for the scientist. In any case, when sandstone is once formed in a fissure, it will crack sooner or later in both horizontal and vertical lines. This characteristic alone is enough to cause it to be mistaken for a wall. It is not known whether the "wall" at Rockwall was formed by the sand being forced up or by sand from above being sifted down into the fissures. If the latter is the case, the surface of the ground at that point has changed considerably, because Rockwall is in the heart of the black land region. That fact alone is enough to discount the Nature theory for those who do not understand the deeper meaning of natural forces. How deep black soil can have a sandstone wall lifting itself from the depths of the ground is more than most of such people can comprehend. Much more excavating must be done before scientists can know the origin of the formation. They prefer to call it a dyke until someone proves it to be something else.

In the meantime the citizens of Rockwall are going about their daily work for the most part seemingly unaware of the controversy. One or two owners of land have taken advantage of their location to advertise the "rock wall". Loiterers on the town square exchange yarns about the formation, farmers still break their plow points on the stones or stop their plowing to explain the mystery to an inquisitive visitor, but most of the people are too busy raising cotton, corn, potatoes and onions to bother with a thing that does nothing but attract the curious.

AN EXCAVATION SHAFT INTO THE "WALL"
This shows the plaster-like substance that is found lying next to the rocks that compose the formation

The "wall" will probably continue to be a mystery because most of us like to be puzzled over things. We like to connect natural phenomena with man's ingenuity since there is romance in what man did one hundred or one thousand years ago. The Rockwall farmer who builds his fireplace chimney of these rocks will no doubt enjoy sitting by the fire on winter nights much more if he believes the wall was made by man many hundreds of years ago, than he would if he knows the rocks were part of an ordinary dyke. Consequently, no matter what science does to explain the structure, many people will continue to explain it in their own way. Man is prone to defend his own opinions, for he thinks they come from experience.

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Sumac In Winter

By MILDRED H. SISSON

Sumac that fired the hills
A month ago,
Now smolders on the snow.
With countless coals
The bobs still glow.

So fierce the fire
That once raged here
The branches show some scorch.
There is comfort in this warmth.
I'll break a bob for torch.

THE BIG TREES IN WINTER

Sun, shadow and snow add cold-weather beauty to the majesty of the Big Trees in Mariposa Grove, Yosemite National Park, California. Scenes like this greet winter visitors to the National Parks, and add scenic thrills to the excitement of skiing, tobogganing and other winter sports. The Wawona Road, shown here, takes the sightseer into the heart of this virgin forest.

KANGAROOS

By WILLIAM M. AND LUCILE Q. MANN

The kangaroo is so different from any other animal that one must envy the European who first saw one. While kangaroos are found chiefly in Australia, a few species live on adjacent islands. The first one of record was from Aru, and was living in the garden of the Dutch Governor at Batavia, Java, in 1711. Sir Joseph Banks, botanist to the Captain Cook party, was the first naturalist to see a living specimen in its native haunts. This was on the famous trip to Australia in 1770, when one of his men reported seeing "animals as large as a greyhound, of a mouse color and very swift." Later on he was surprised to see these animals bounding along on their two hind legs like a jerboa, and he stated that to compare it to any European animal would be impossible.

The kangaroos stand out as a distinct group of marsupials. There are kangaroos, rat kangaroos and wallabies. The rat kangaroo differs from the others only in technical characters, such as the structure of the teeth and the bones of the feet; the wallabies are merely kangaroos with the thick part of the upper lip naked instead of hairy.

Varying from the size of a rat to that of a large dog, the kangaroos are generally distributed throughout their respective ranges and some still persist in numbers in less settled parts, in plains, open woods and even in dense forests.

It has long been established that the kangaroo is born in the usual way instead of growing in the pouch, but this is a subject unsafe for discussion in Australia. There are two strong schools of belief there; Australian friends of long standing fall out and become bitter enemies over arguments on this question, and never speak to each other again.

The single young is born at an early stage of development, the period of gestation even in the largest species being less than a month and a half. When born it is scarcely larger than a peanut. The mother herself sometimes places it in the pouch; in other cases it worms its way there, where it attaches itself to one of her nipples and remains for many months. Even after the baby has

grown considerably and ceased to nurse, it is fond of resting in the pouch and returns there after feeding.

There was one case in the National Zoo in Washington where the mother for some reason refused to let the baby re-enter her pouch, but grandmother kangaroo was more friendly, so the baby availed itself of her hospitality and spent much of its time in her pouch, despite the fact that the grandmother's own baby was occupying it at the same time. Sometimes the baby in the pouch is so large that it appears ridiculous; it cannot get all in and a leg or a tail will project, and one feels sorry for the mother as she hops about carrying this awkward load.

The baby kangaroo is not weaned until long after it has left the pouch; sometimes one will nurse even after the mother is carrying another baby.

The kangaroo is of little commercial value. Its fur is not good in quality and its flesh is not generally eaten save by the aborigines. Members of exploring expeditions, however, have been saved from starvation by roast kangaroo. The tail is sometimes used for soup.

The skins have some value, and in Australia farmers and local hunters have done much toward reducing the number of kangaroos, partly for the skins, which make fairly good leather, and partly because troops of the animals occasionally raid cultivated patches. The damage they do, however, and the value of their skins, certainly do not warrant the extermination of such interesting animals. Australians realize this, and are trying to

limit their destruction as well as to establish a number of National Parks and sanctuaries, so we may expect mobs (as the Australians call the groups) of the big red kangaroo to be hopping about for many years yet. He can hop, by the way, fifteen or twenty feet at a bound when in the mood for it, and his great tail gives excellent balance while he is in the air.

Kangaroos do well in captivity. Excepting those that come from northern Australia and New Guinea, they do not require artificial heat and they thrive on a diet of vegetables and hay. But from time to time there occurs a destructive and little understood malady called puff jaw. The jaws swell to enormous size, the animals are unable to eat, and die in distressing numbers. Jaws of kangaroos from Australia show signs of this disease so it is evidently endemic there, and no cure has ever been found. Sometimes it wipes out an entire collection of kangaroos in a zoo.

In the history of the National Zoological Park in Washington there have been exhibited no less than sixteen different kinds, and one of them, a wallaroo, lived here for thirteen years. Five different species have produced altogether fifty-eight babies while captive here. Sometimes they become very gentle. One fine specimen was presented to President Coolidge by the citizens of Tasmania, and was brought to the park by the *U. S. S. Richmond*. The sailors aboard must have liked the animal, for we remember that when it arrived in Washington its cage was the most spic and span we had ever received, a testimony to good care and naval efficiency.

At one time a colony of small wallabies was established on the island of Munia in Fiji, by some well-intentioned person, and they did well and increased in numbers until the local possessors of firearms destroyed them all. In the north of Holland, the great waterfowl fancier, Blaauw, has a troop of Bennett's wallabies in a large field where they have lived successfully since 1886 and are still prospering.

CAMELS OF THE PLANT WORLD

Photographs from C. Anders

Even the novice in the realms of biology realizes the preponderant rôle that water plays in the life of a plant. This knowledge is forced upon him by the behavior of the plants decorating his home, and the vegetable life in field and garden. The search for the life-giving element stamps its mark deeply on the plant, and modifies its whole development, as with other forms of life.

It would lead us too far afield even to outline the full range of devices incorporated in the structure of plants to obtain and utilize water. The pictures accompanying this article show only a few examples of the extraordinary adaptations that are brought about in the vegetable world by the difficulty of procuring an adequate supply. These plants have been obliged to live under highly unfavorable water conditions, especially in soil that retains no water, or under climatic conditions that offer an ample supply only occasionally, perhaps during one very short season each year. Prominent among such plants are those that grow in desert-land or steppes, or cling to rocky slopes or cliffs. The principal need in such cases is two-fold: when water is obtainable, the greatest possible amount must be collected, and this accumulation must be kept as nearly intact as possible for use in time of need.

In the unfailing and universal diversity of Nature are

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Mesembryanthemum (or ***Lithops***) ***pseudotruncatellum*** (left, above) is a plant of southwestern Africa. From a fissure in this plant, which is shaped like a breakfast roll, there issues a bright yellow flower. This double leaf seems to afford an extreme example of leaf-succulence.

This widely different plant, ***Mesembryanthemum ecklonis*** (right, above), indicates the great variation that occurs in this wide-ranging genus. The thick cylindrical leaves, themselves water storers, are covered with blister-like vessels that conserve a further supply. The flowers are white.

This is (below) ***Senecio incana*** from South Africa, sometimes referred to as ***Kleinia.*** Hardly anyone would recognize this plant as a relative of the golden ragwort of the fields of eastern North America, but it is one of about 1200 species of this variable genus, widespread over the globe. In obedience to its arid habitat, it has developed fleshy leaves for storing water.

to be found numerous solutions of this problem, some of which involve almost grotesque modifications of the structure of the plant. In most cases (but not always) this modification takes the form of a thickening of the organs in question. According to the part of the plant affected, this phenomenon is called stem-succulence or leaf-succulence. The cactus is a well-known example of the first type. Leaf-succulence and other systems of water storage are illustrated by the accompanying photographs. The change in composition of the organs may be carried so far as to destroy all resemblance of the popular conception of a "leaf". As may be seen from the photographs of *Dischidia,* succulence is not the only remedy applied by plants to the problem of an unreliable water supply.

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The genus *Mesembryanthemum* (mid-day flower), using the generic name in its broad sense, includes several hundred species, most of them native in the dryer parts of South Africa. Some occur in Australia, New Zealand, the Canary Islands, Arabia, and the Mediterranean region, and two are natives of Mexico and southern California. The family, Aizoaceae, is related to the cactuses.

This is *Mesembryanthemum bolusii* of the sandy deserts of South Africa. The reddish flower comes from a bud that develops at the junction of the thick leaves. The second illustration shows the flower after night-fall, when it closes for protection. In the lower figure is the blossom opened to the sun.

The ingenuity of Nature is well illustrated in this tropical climbing plant, *Dischidia rafflesiana* of southern India and Borneo. The slender-stemmed vine ascends lofty trees, encircling the trunk in long spirals, and clinging by slender rootlike branches. The leaves are of two kinds—small ones in pairs, and larger ones, three or four inches long, that form veritable pouches.

These leaf-pouches have an opening at the base, into which the rain-water trickles from the stems, to be held until it is needed. Within the pouch grow aerial roots that transfer this water to the plant. These leaf-roots are well shown in the cross-sectioned leaf in the upper figure. Thus the lofty crown uses moisture that it has intercepted in its earthward journey, at times when it would otherwise perish from thirst, since its distance from the ground precludes the drawing of sufficient moisture through the long slender stem that connects it with its earth-buried roots far below.

A SEA ANEMONE BREAKFASTS

Although similar in appearance and rivalling in colorful beauty the flowers for which they are named, sea anemones are, of course, not members of the plant world. We have graphic evidence of that fact in the pictures on this page. We see a fish breakfast grasped by the tentacles of the anemone and gradually drawn in to be devoured.

Sea anemones belong to one of the major divisions of the animal kingdom, the Coelenterates, or "stomach animals." Voracious feeders, these "flowers of the sea" have a single sac-like body and digestive cavity combined. The tentacles not only have a sticky mucus, but are furnished with tiny moving hairs that waft foreign substances and particles away from the body when the anemone is not feeding.

These tentacles are also supplied with nettle-cells, tiny sacs filled with an irritating fluid that benumbs animals that are caught. The prey is then brought in to the mouth in the center of the disk, around the outer edge of which are the tentacles. Through a short gullet it goes to the stomach to be digested.

Sea anemones multiply from eggs, by budding, and sometimes as a result of mutilation. The tiny ciliated ball that comes from the egg, or from budding, floats or swims about for a time, and then becomes attached to rock or shell. Photographs, C. Anders, Paris.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

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THE TIDE IS RISING

We wish that all those who yearn for the preservation and restoration of the American countryside—and they are legion—could have attended a conference held recently in New York City. Had this been possible they would have carried away, as we did, the conviction that the tide of public sentiment is rising against the ugly commercialization of America's roadsides. It is rising relentlessly to engulf and sweep away eventually those who have, Canute-like, defied the public interest. By the mere force of public opinion, aided where necessary by rural zoning, restrictive legislation or taxation, these hideous and dangerous parasites of the roadside one day will be denied the right to capitalize, at little or no cost, on the incalculable public investment in highways.

ROADSIDE PARASITES

This conference was called jointly by the National Roadside Council, the Conservation Committee of the Garden Club of America, the Roadside Development Committee of the National Council of State Garden Clubs, and the American Planning and Civic Association. It was attended by representatives of state planning boards, state highway departments, the United States Bureau of Public Roads, the American Automobile Association, the American Nature Association, and many state organizations and interested individuals. It was a "working conference" designed to bring together reports of progress and to chart the course for the future. It admirably achieved both objectives.

Space does not permit a detailed report of the discussion of legislation, past and prospective; the tangible evidences of an aroused public opinion; the growing realization of many national advertisers that the rural billboard is a negative medium for the distribution of their products; the recognition of the distraction of the rural billboard as a menace to highway safety; the incompatibility of an ugly countryside with modern highway construction.

All these and other matters were extensively discussed. One new recruit to the ranks was enthusiastically wel-

comed—*The Reader's Digest,* which has inaugurated a militant campaign of public education. The invitation in the articles in this magazine to write to the National Roadside Council for information and material has resulted in a flood of requests. And, interestingly enough as commentary on the claim of the billboard industry that the campaign against them is a "women's movement", more than ninety per cent of these requests came from men. In fact, at the recent conference the men were in a slight majority. So, with the women, who admittedly do most of the country's buying, allied with men, finally aroused and active, we believe that our first paragraph is an understatement.

Another recruit is Robert Moses, the distinguished Commissioner of Parks of New York City. In an address before the New York *Herald Tribune* Forum he reviewed the years of attempted cooperation with the outdoor advertising industry in the hope of achieving a recognition of the public right to roadside beauty. Agreements, he declared, have "been ruthlessly and wantonly broken". Out of his long experience, Mr. Moses concluded:

"As a conservative, I have long hoped for cooperation from this group, but it is clear now that it is not forthcoming, and, under the circumstances, as an official responsible both for the preservation of our natural heritage and for many public improvements, I urge upon you the necessity of a carefully planned relentless drive on billboards and outdoor advertising, a drive which will bring the reactionaries who control this business to their knees, because there is no sense of making great plans of preservation and improvement unless you are prepared to police them afterward."

Yes, the tide is rising, and public opinion in America cannot be denied when once determined to right a wrong.

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VIOLATIONS OF WATERFOWL REGULATIONS

It is disquieting and discouraging to note, from time to time, the shameless efforts that are made to discredit and defy the regulations made by the Secretary of Agriculture to preserve from extinction the waterfowl of North America. We do not refer alone to violations by individuals, who may be ignorant of the importance of such regulations, or irresponsible, but to those well-planned efforts to defeat justice that come from organizations that are able to retain legal talent willing to defend practices that should be beneath the consideration of all good citizens.

The Department of Agriculture is the agency charged by Congress with the administration of the act that gives effect to the convention between the United States and Great Britain (Canada) known as the Migratory Bird Treaty. The sole purpose of this treaty, and its supporting law, is to preserve and perpetuate the birds that in their migrations pass the boundary between the two countries. This salutary object is of benefit to all citizens of both countries, and it is the duty of every citizen to obey the regulations made for his benefit. But the Treaty Act, now twenty years old, has been subject to a constant barrage of attempts to effect its nullification. If all those who have used their influence, openly or in hidden ways, to cripple the treaty were named in a list, and this list was compared with a list of self-styled conservationists, some startling facts would appear. A few influential men whose names would appear on both lists were even members of the unofficial board (now, happily, abolished) who used their influence to cripple, rather than to aid, the birds for whose benefit the act was put on the statute books. Of course, this is another story, and an interesting one; it occurred to us because we note that a picked few of these gentry are still operating effectively, and on a large scale.

During the past year, several noteworthy examples of shameful attempts to cripple the Department's administrative efforts to help the waterfowl have been staged. An important case was that of the Cerritos Gun Club, and associated corporations, in an appeal from the decision of the District Court of Southern California. The appellees were wardens employed by the Biological Survey. Judge Denman, one of the justices, described the case as follows:

"This is an appeal from a decree dismissing without leave to amend the bill of appellant, a membership corporation, and three corporations, owners of land in Southern California improved for migratory wild fowl hunting, seeking equitable relief for the protection of the value of their investments, by enjoining appellees, federal officers, from prosecuting them for luring, with grain, migratory game fowl to their properties, there to be shot by their stockholders and members."

The main issues involved the right of the appellants to protect the value of their investments (which, as appears by the arguments, were based on a resource not their own, but one controlled by the State for the benefit of all the people), which had been injured by the regulation forbidding the use of bait to lure the waterfowl to their death. This long-established custom of baiting was long recognized as unduly destructive to waterfowl, but it took many years for conservationists to ban it legally. Now, after it has been outlawed about three years, so effective is baiting that the enemies of our waterfowl still find means of practicing and defending its use.

The arguments in this case cover many pages, and their discussion would be tiresome. For our present purpose it is sufficient to state that the government won the case. Thus is the right of the Department to defend the waterfowl again affirmed. But what must be our appraisal of those who continually seek to overthrow the major defence that stands between the birds and their enemies? Should the Treaty Act be discredited, even the most lawless of the destroyers could not long enjoy the killing of the remnants that their selfish efforts have left alive.

Among other cases of attempts to evade the regulations are efforts to lease for waterfowl shooting marshes in which grain has been (Continued on page 40)

Marajo—Paradise of Bird Life and Lesson in Protection

Intimate glimpses of the wonder island of Amazonia

By ARTHUR H. FISHER

Photographs by the Author

THE GREAT WHITE HERON WITH AIGRETTES IN THE FULLNESS OF THEIR BEAUTY

The great colony on Marajo is protected, but the fallen plumes are collected, cleaned by special process and marketed.

EVEN in these days of ever increasing interest in geography, exploration and Nature study, there are few with an intimate knowledge of an island with more than one hundred miles of shoreline washed by the waves of the Atlantic, as large as Denmark, and lying directly in the mouth of the Amazon River. Fewer still are aware of the remarkable wild life on this equatorial island, the Island of Marajo.

It was my good fortune, while engaged in archaeological research and wildlife photography in the Amazon Valley, to spend many weeks on Marajo. To me it will always remain a wonderland and an ornithological Eden. And little wonder, since my introduction to the bird life of the island was indeed spectacular.

While in Para I heard much of a densely populated nesting colony of *garcas*—as egrets are locally called—on the Rio Cambu, one of the smaller and little visited rivers of the island. I also heard that it was protected, which was hard to believe in view of the extensive sale of aigrettes, peddled on the streets of Para. It was therefore with keen interest that I engaged a small sailing craft and crew, and set forth one evening shortly after sunset from a point about forty miles distant from the mouth of this tidal stream.

After riding out one of those squally deluges for which the Bahia of Marajo is rightly infamous, and which threatened to abort further exploration, we anchored off the mouth of the Rio Cambu to await the coming of daylight and a change of tide. With a cool breeze from off shore, there were no insects to mar the beauty of a starlit night.

With the coming of dawn I saw the most amazing panorama of bird life I ever hope to witness. Literally thousands upon thousands of feathered fishermen came

THE HANGING NESTS OF CASSIQUES
These beautiful orange and black birds build after the manner of orioles and seem to prefer locations near to settlements

winging their way from the interior of the island to their fishing grounds along the coast. It was kaleidoscopic. First came long wedges of cormorants (*Phalocrocorax vigua*) passing so low overhead that I could see their eyes. The noise of their wings was like the whistling of wind through the halyards of a ship. Then the air seemed filled with hosts of white herons, *Casmerodias egretta,* with a generous mingling of lovely blue *margoaris.* Long undulating lines of scarlet ibises, *Eudocinus ruber,* flying in V formations perhaps a mile in length, streaked like crimson streamers across the gray-blue sky. Such scenes continued for fully a half an hour, while high above it all seven Jabiru storks, *Jabiru americanus,* to me the most inspiring of all avian airmen, were putting on a real "flying circus".

After such scenes, I was prepared for almost any photographic opportunity. About seven o'clock, with ample water on the bar, we dropped anchor inside the mouth of the Cambu, about half a mile from an outpost of a large cattle ranch, a comfortable two-roomed shack that I was permitted to use as a base of operations. A short distance from this outpost, directly opposite a high bank, I came upon a large colony of *japims.* These beautiful orange and black cassiques, *Cassicus icterronotus,* always seem, whenever possible, to build their nests near the habitations of man. Oriole-like, they construct long hanging nests, with small openings at the top, grouping their aerial apartments along the branches like a collection of well-filled Christmas stockings. These highly intelligent birds practice polygamy on a liberal scale, the females far out-numbering the males.

Setting up the Akeley camera and slipping in a telephoto lens, I proceeded to pry into their most intimate family affairs. At first they viewed my actions with suspicion, scolding and apparently discussing this strange white man and his peculiar ways and gadgets. However, in a short while they became first-class movie stars, settling down to their usual routine. Their communal and gregarious nature was apparent in all their actions, particularly in the care of their young. How their mass movements were directed I failed to discover. What I could observe was that the entire adult colony would leave in a body to make their way into the nearby jungle. For several minutes it would be like a deserted village. Then, just as suddenly, they would all return with jungle tidbits for their young hopefuls, all the while keeping up an incessant chatter of strident calls. From early dawn until bedtime they continued their garrulous gossipings and scoldings.

The following day I set out to visit the heron colony and explore the Rio Cambu. I had carefully arranged the time of my visit (early in August) when the fledglings were in the nests and activities at their height.

For the most part hemmed in on either side by swamp and jungle, a more beautiful stream than this is truly hard to imagine, as it winds its serpentine way through the campos section of the island. In many of its reaches tall trees project their branches from either shore into a bower, festooned with air-roots, these in turn forming trellises for garlands of vines and creepers. Interspersed among the many shades of green, gaily painted blooms of trumpet vines burst forth, while an occasional orchid claims its right to add a bit of color to an already scenic masterpiece. Large crimson dragon-flies poise for a moment against the greens, the next moment to dart into another equally charming setting. Morphos, those vagrant princes of butterflies, bluer than any sky, languidly flutter into view, then vanish on their careless way. It is like a fairyland.

In some places both banks are lined with mangroves and ciri-ubas, their stilt-like roots radiating in all directions, while in some of the more open reaches masses of delicately formed bamboo and burity palms dominate the outer fringe of the jungle barriers. Almost every stroke of the paddle brought something new to delight the eye. Now and again from the forest would come the flute-like notes of the *sabia, Planesticus albiventris,* a thrush related to our robin that excels in the beauty of its song. In contrast, flocks of large parrots, *Amazona amazonica,* made their screeching way through the tree tops. Birds were always in evidence in large numbers. Ibises, spoonbills, boatbills, white herons, blue herons, pileated herons, snowy egrets, margoaris, and different species of kingfishers appeared at every turn. Our invasion of their quiet haunts brought little evidence of fear, for they constantly kept within easy range, only rising for short flights when we were almost upon them. One impudent small king-

LIKE BLOSSOMS ON THE TREES
Herons in the colony were like huge white flowers and in great numbers

fisher alighted on the bow of our canoe and carefully inspected one of my cameras.

When we approached within a half mile of the colony we could hear the uproar of the herons, and noticed an increasing number of the birds in full plumage patiently waiting on the banks to spear an unwary fish. The noise constantly increased until we came abreast of the breeding grounds. Then the din of thousands of raucous cries was amazing.

The heronry occupies several acres, mostly a growth of large mangroves, with the ground free of underbrush and dry at this season of the year. The number of birds, young, and nests defies anything beyond a rough approximation. The nests crowded the high branches of the hundreds of trees, which appeared as though in full bloom with huge white flowers, not to mention the hundreds of birds that were constantly coming and going. The young were in various stages of development, from helpless nestlings to hundreds of youngsters that stalked about on the ground in comical fashion, awaiting the final growth of their flight feathers. Overhead the noise and confusion was almost deafening, with the parent birds awkwardly landing among the nest-weighted tree tops, causing endless brawls with their neighbors and continuous casualties. Even in the incessant din one could hear the dull thud of some unfortunate fledgeling that had been pushed or had fallen from its aerial cradle. I started to count the number of these casualties but soon gave up, for the black vultures had the edge on me. One had to move fast to even get the body of one of these unfortunates. However, as disastrous as these casualties seemed, I felt sure the youngsters would not be missed in all that bedlam above. Nor did the reports of my rifle, fired out of curiosity, seem to frighten the colony to any marked degree. To me this was significant in view of the statements I had heard in Para concerning this protected heronry, to which I had given little credence since Brazil did not join with other countries in an international agreement for the protection of plumage birds, and because so many plumes were sold in Para, only seventy miles distant.

So much was written at the time proper laws were enacted to save these birds in our own Southern States, that it seems needless to add that it is only during the courting and nesting season that herons are sought for their aigrettes, this being the only period of the year they are so adorned, or to state that when the adults are killed it means a horrible lingering death for the young. Furthermore plume-hunters carry on their work at night, and I shuddered to think what these hoodlums could and would do to such a colony as this. However, it took but a short time to convince me that no such vandalism was

A RARE PARROT FROM AMAZONIA
This is the hawk-headed parrot of the Amazon Valley of Brazil, noted for its crest development

MORE COLOR OF MARAJO
Red and blue macaws added beauty to the bird life of the equatorial island of the Amazon

being carried on in the heronries of the Rio Cambu.

Fortunately these nesting grounds are on privately-owned lands, and during the breeding season watchmen are always in attendance. No birds are killed, and only the shed plumes are taken. The aigrettes are all carefully gathered from the ground, and cleaned by a special process. By this splendid system of conservation, the owners of these lands net a handsome yearly income, for there is still a large demand for the plumes in Brazil and other countries that so far have no taboo on their sale for millinery purposes. Had such a practice been possible in our own Southland, milady in North America could still adorn her hair or coiffure with these lovely feathers. Cruelty and commercial greed, and the important fact that our heronries were seldom on private lands, made this impossible, but thanks to the untiring efforts of organized bird lovers, these birds seem to have been saved a place under the sun in the United States.

Before leaving the heronry, I came upon a most interesting example of bird lore. Under a dead tree, on the edge of a sizable nesting colony of cormorants adjoining that of the egrets, I was surprised to come upon a considerable pile of snail shells belonging to the genus *Ampullaria.* These snails can close up their shells with almost the security of a box tortoise, and I had seen many of them on the open campos where they occur in large numbers. I was curious as to why so large a collection of empty shells should be in this out-of-the-way spot, and it seemed as though they must have been dropped from the tree under which I found them. While I was speculating, the solution of the problem alighted in a nearby tree—a *gaviao de urua.* These strangely evolved hawks are fairly plentiful in the lower Amazon. They have developed an elongated, highly specialized hook on the upper mandible, something after the order of the kea, the parrot of New Zealand. I had read that these birds fed on snails, using this hook to tear them from their portable fortresses, and now the evidence was before me.

Guara is the local name for scarlet ibis, and a large nesting colony of these birds gave a small lake its name. Engaging horses and cowboys, I was off early one morning on my quest for more adventure and this notable colony.

It was slow and hard going, as much of the campos was still under water, and for considerable distances our ponies had to pick their way over wide boggy stretches, often floundering up to their bellies. They never failed to extricate themselves, however, even in the tightest places, and with a knowingness I feel sure only a Marajo cow-pony could show. Although we were travelling almost directly under the equator, and my only head covering a light felt hat, I did not experience the slightest discomfort from the sun. There was a considerable breeze, and with so many things to hold a field naturalist's attention, I was hardly conscious that I was fast acquiring a heavy coat of tan. It seems strange that heat prostration, or so-called sunstroke, is a thing unknown in equatorial Brazil.

Large flights of ducks were constantly rising as we approached, sometimes in such numbers as almost to blot out the sun, and cast huge shadows on the lush campos. They would make short flights and then settle in regular rows with almost military precision. Here and there large jabiru storks dotted the landscape, but their take-offs fall far short of the grace they display in the air. As a matter of fact, nothing could be more awkward or amusing, and they require plenty of runway. Always there was a wealth of bird life in great variety, while, overhead, flights of egrets and scarlet ibises were ever in view.

It was just before sundown when we arrived at Lake Guara, and in that gorgeous tropical light that comes just before a short equatorial twilight, I saw my second great inspiring sight of bird life on the Island of Marajo. With the closing of day nearly the entire colony was returning from the feeding grounds to roost, and I may be understating the facts when I say that the long waving flights of these vividly scarlet birds came toward the lake in lines perhaps two miles long.

Every bush on half the shoreline of the lake, was aflame with ibises. The young are black in their first plumage, and were well advanced at that time. The effect of the combination of scarlet and black against backgrounds of greens and blues, reflected in the still waters of the lake and illumined by a rapidly forming sunset, has left with me a memory that can never be erased.

To those who care for adventure in a so far unmolested naturalist's paradise I can say without any reservation: "Go to Marajo, the wonder island of Amazonia."

Things to Think About

From February 13 to 17 the Fourth North American Wildlife Conference will be held at the Hotel Statler in Detroit, bringing together sportsmen and conservationists from all over the United States and from Canada and Mexico. Sponsored and managed by the American Wildlife Institute, the conference will follow the successful method of last year by having panel discussions of outstanding wildlife problems. In this manner varying viewpoints will be presented on controversial issues and on subjects that need clarification. Concurrently there will be technical sessions covering research in the wildlife field.

Among the important questions that will be considered through the panel method and through discussion from the floor will be pollution, an issue that will be actively before the new Congress. It is planned to have fewer topics for discussion and to devote the fullest time possible to those considered.

The annual meeting of the National Wildlife Federation, headed by "Ding" Darling, will be held in conjunction with the Conference.

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Language "that is unjustifiably optimistic, not to say misleading", is being used in advertisement and otherwise to entice overseas sportsmen to the Union of South Africa for big and small game hunting, according to J. W. H. Wilson, secretary of The Wild Life Protection Society of South Africa. In a letter to the American Nature Association, Mr. Wilson writes:

> There is still much good hunting to be had in many parts of South Africa, but mostly on privately-owned farms where, in many cases, game is carefully preserved. Speaking generally, game is to a great extent strictly protected by law throughout South Africa, particularly in the Transvaal, and permits for shooting certain species of game are only granted in those districts where those particular species are fairly numerous.
>
> Roan antelopes are being strictly protected everywhere. Only in special circumstances will permits be issued for shooting oribi, reed buck and sable antelope. Permits to shoot wildebeest, zebra, kudu, impala and waterbuck are only issued in those districts where these animals are sufficiently plentiful. Permits to shoot elephant, hippo, rhino, and giraffe are not to be obtained.
>
> Even a farm of 10,000 acres well stocked with game might easily be deserted by game, other than birds, after a week or two of intensive shooting, and disappointment is bound to be the lot of many who come to South Africa on the strength of such promises.

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Census figures of elk and mule deer in Rocky Mountain National Park indicate a twenty per cent increase for the former and fifteen for the latter as compared with 1937. Rocky Mountain bighorn sheep show a decrease and are reported to be disappearing due to disease and other unfavorable conditions. Bears have increased slightly but are not numerous, while most small mammals have shown a marked increase.

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The American Humane Association, with headquarters at 135 Washington Avenue, Albany, New York, announces its twelfth annual humane trap contest. National prizes totalling $550 and state prizes of $125 are offered. The purpose of these annual contests is to stimulate interest in the development of humane devices and the use of humane methods for taking animals when their capture is necessary. Entry forms and further information may be had from the Association at the above address.

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Sixteen and a quarter million people visited the numerous units of the Federal park system during the travel year ending September 30, 1938, according to a compilation of the National Park Service. This represents an increase of about one million as compared with 1937 figures.

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"Duck stamp" sales for the fiscal year ending June 30, 1938, brought in a revenue of $783,039, according to announcement by the U. S. Biological Survey. This surpassed, by almost 150,000, the revenue of the next highest year, which was 1934-1935. The stamps cost one dollar each and are required on every license to hunt migratory waterfowl. A number of the stamps were sold to stamp collectors. The bulk of the revenue thus derived is used to acquire and maintain refuges for migratory birds and other wildlife.

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Cooperative action between the National Park Service and the United States Forest Service to promote and protect the Maine-to-Georgia Appalachian Trail has been announced. A protective strip will be established along 546 miles of the trail through eight National Forests and 158 miles in two National Parks. This trailway will be treated as a distinct type of recreational area devoted particularly to hiking and camping.

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Valuable factual material bearing upon our American wastage of wildlife is presented in a bulletin entitled *Punishment Lies Near!*, written by Mrs. Edward Breck and published by the National Anti-Steel-Trap League,

Washington, D. C. The author discusses the attitude toward so-called "vermin" and predators and presents important scientific evidence to refute the loose claims against these forms made by those seeking something to shoot at. Copies of the bulletin are available at ten cents a copy.

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Miss Juanita D. Helmer of Plainfield, N. J., has spent several years training Girl Scout leaders and Girl Scouts to appreciate the outdoors. In that time she has arrived, through experience, at a number of convictions about conservation. One of these bears upon a subject of real importance to both wildlife and wild plants, and in connection with it she sends up a statement entitled "A Protest". We are happy to pass it on in the hope that it may carry its conservation message to others. Miss Helmer writes:

Every spring and fall our country neighborhood experiences an epidemic of destructive, expensive and unnecessary field fires. Every week-end the peacefulness of life is blasted by a deafening fire whistle, nerve-wracking sirens and leaping flames across the meadows. Were there a benefit, one might conceivably bear the annoyance, but, since the fires are utterly useless, one feels justified in protesting. It is not only our peace of mind and holiday that is destroyed; frequently garages, chicken coops and even homes succumb to the fiery onslaught. In addition, the inevitable destruction of plant and animal life is a crime against the conservation of our natural resources.

Walk over a field, when the ashes cool, with your eyes open. Notice the scorched bushes, the charred bark of young trees, the dead turtles and the ruined bramble-patch that had made a peerless rabbit-warren. In the spring, see how many nesting sites have disappeared, how many mouse trails are lines of blackened cinder! In the fall, wonder where the chickadees will get seeds for food and the pheasants brush for shelter. Then, as you scuff home through the dusty remnants of plant life, make an estimate of the amount of fertility that will never be part of the top-soil—top-soil that grows, not by years, but by centuries.

Can you justify such waste? Can you smile at the points in the tax rate that are the fire department's budget? I can't.

Why all this fruitless expense? Why not have the fire department, instead, burn off along highways only enough brush to clear safety lanes against the misflung cigarette? Why not, to assure peace of mind to owners, burn off or cut only the brush adjacent to buildings? If necessary, charge a fee for the service. Why not penalize those who start these uncontrolled fires? It would be cheaper for all of us in the long run. However, there probably would be a loud complaint from those neat souls who like their fields and woodlands tidy. Well, why do they live in the country? They should live in a city park!

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In the *Minnesota Journal of Education* for October, John J. Benson discusses a high school course in conservation. In his article he points out that "from the first there has been one obstacle to effective teaching of that part of the course concerned with the natural resources. No suitable textbook or reference works are written on the Junior High School level." Mr. Benson, so far as we have been able to discover, is entirely correct. He points out, further, that recourse had to be had to bulletins and miscellaneous circulars gathered from here and there. Under such circumstances it is difficult for most teachers to organize a consistent and effective conservation course. Schoolbook publishers please note.

SEA OTTERS ON CALIFORNIA COAST

An experience of more than usual interest to members of the American Society of Mammalogists visiting California in 1938, was the opportunity to see a herd of sea otters along the coast of Monterey County, California. Since the presence of a herd of this extremely rare species in our waters was unsuspected until recently, most of the members had never seen one. The following account, quoted from the November, 1938, issue of the *Journal of Mammalogy*, page 526, deserves wide publicity because of the necessity of protecting this herd:

In direct ratio to the potential interest of this mammal is, undoubtedly, the concern of the Society in regard to the adequate perpetuation, and indeed the increase, of the existing stock.

With commendable promptitude after these animals were reported, the state Division of Fish and Game assigned a warden to their protection. But there are unusual features concerned, and more vigorous action may be necessary.

The part of the coast of Monterey County along which sea otters now occur is mostly precipitous, wild, and sparsely inhabited, but with a new highway skirting it for some distance. A dozen wardens could not prevent determined harassment of the animals. Furthermore, small commercial fishing boats, many of them owned by aliens, abound.

The threat to the sea otters is of two main sorts; one because of the value of their pelts, and the other because they are alive and feed close to shore. Where the animals are most readily accessible from the highway are displayed picture postcards of them, including one with the legend "Over $25,000 in otter fur afloat." There is also a local rumor that a Hollywood actress paid a Japanese fisherman $1,500 each for three pelts. It makes no difference whether or not this rumor be true, the harm done is that local residents, one and all, are aware that a sea otter pelt is the cash equivalent of many months of hard work.

Accessibility from the highway results in much disturbance of the animals. Stones and even fire-crackers are thrown from the bluff at those close to shore. Repeatedly tourists have stopped and shot at the otters, with rifle or pistol, with little likelihood of resulting trouble for the shooter, for if apprehended by a warden he could claim to be occupied in target practice at seaweed. During the summer it was stated by local residents that the sea otters were markedly more wary, and less given to gathering in bands, than three months previously.

It seems evident that in addition to a patrol service as effective as practicable, this part of the coast line should be made a wild life sanctuary, with discharge of firearms prohibited.

VIOLATIONS OF WATERFOWL REGULATIONS

(Continued from page 34) planted; the selling of large quantities of ducks, quail and woodcock that were legally killed; the wholesale trapping and sale of waterfowl; and the serving by restaurants and nightclubs, which in some cases were open throughout the year, of waterfowl, quail, plovers, doves and other birds. In one case where the culprit finally received a penitentiary sentence, birds had been purchased from gunners over a period of years, and were wholesaled to other establishments. In many cases the states, to their shame, are singularly lax in cooperating with the Federal Government.

With such disregard for a decent compliance with the laws and regulations protecting our game, reaching an aggregate whose volume cannot be even approximated, the wonder is that any of our game birds, resident or migratory, are left to breed.

Mineral Collecting—Why Not?

The Year-round Hobby

By WILLIAM D. QUINN

COURTESY J. A. HIGGS

DISPLAYING MINERAL SPECIMENS
An ideal case is one with glass sides, top and shelves, and with a mirror back.

IN YOUR wanderings over the countryside you may encounter someone equipped with knapsack and prospector's pick, tapping quarry walls, smashing fieldstones, or searching through mine waste piles in quest of fine mineral specimens. Occasionally the cry of "Eureka!" may be heard, and lead one to some enraptured advocate of the hammer gloating over a prize whose value is apparent only to himself.

Mineralogy draws its devotees from all walks of life. Business man or woman, teacher, lawyer, doctor, chemist or clerk—any will sneak away on the least excuse to spend an afternoon at the rock pile.

To become an enthusiastic "rock hound" one needs only to see a good collection, attend a meeting of any mineral club, or, indeed, merely catch the fever from one who has already been bewitched with the fascination of mineral collecting. Once in the fold, the newcomer should supply himself with a good book, such as *Getting Acquainted with Minerals* by G. L. English. After reading such a book and following its suggestions, one is ready to commence hoarding specimens.

The bugaboo of all collectors is providing room to house the prizes. If you will have many visitors an exhibition case is the thing; otherwise a cabinet of drawers will prove satisfactory. A jeweler's or doctor's glass case with glass shelves is best, although a bookcase may serve the purpose. In a cabinet of drawers much room will be saved if they are shallow. The drawers would best be filled with small pasteboard trays or box tops to prevent specimens from shifting and rubbing against each other.

Every specimen should be numbered, cataloged, and labelled. A true devotee will rarely tolerate a piece with no recorded locality; and a specimen is practically useless without its label. A label for exhibition purposes should be of thin cardboard and about 1½ x 2 inches, if it is to be typewritten. A label should record catalog number, name, chemical formula, and locality. A catalog should contain all that is on the label, plus size of specimen, outstanding features, and source of supply.

Anyone undertaking the study of mineralogy will greatly simplify his hobby if, at the beginning, he purchases a few of the more characteristic minerals, which should be recognized at first sight. In any event the beginner should have, in a new study collection, ten minerals in the scale of hardness. A mineral's relative hardness is determined by comparison with others of known hardness. These are, with their numbers in the scale—1, talc; 2, gypsum; 3, calcite; 4, fluorite; 5, apatite; 6, feldspar; 7, quartz; 8, topaz; 9, corundum; 10, diamond. If, for example, a certain mineral is scratched by feldspar, will not scratch apatite but will scratch fluorite, its hardness may be assumed to be about 5. The hardness of most minerals is quite uniform, and thus this test is an aid toward identification.

In addition to these basic minerals, the beginner would do well to start his collection with fifteen or twenty other minerals, if possible. Some that might be suggested are copper, azurite, galena, sphalerite, hematite, magnetite, dolomite, asbestos, mica, epidote, malachite, chalcopyrite, stibnite, pyrite, calcite, limonite, tourmaline and garnet.

To identify the common minerals only simple tests are necessary. If a mineralogist received a specimen, he might note that it was lead-gray in color; that when rubbed against an unglazed porcelain tablet it left its "streak" of lead-gray; that its hardness was 2.5; that its luster was metallic; that it seemed usually heavy.

From this the mineralogist would tell you that the mineral was *galena,* a lead sulphide. While most mineralogists could tell this at first glance, all these tests, and possibly many more, are necessary to name certain specimens.

Once one recognizes some of the more common minerals he is prepared to start accumulating specimens. A small canvas collecting bag with draw strings will be needed. A good strong hammer with chisel edge at right angles to the handle is essential. A small chisel for getting into little crevices will come in handy. Newspaper and tissue paper to keep specimens separated should be taken along.

Where to look for minerals depends on the region. Places where rocks have been bared by erosion, or where

PART OF THE AUTHOR'S COLLECTION
A corner of his den where his minerals are kept and where he carries on his hobby indoors

excavations have penetrated rocks, are likely collecting grounds. Huge garnets of superlative quality, and remarkable tourmalines, are frequently found when building foundations or subways are being excavated on Manhattan Island. Quarries, mines, and road cuts everywhere are the favorite haunts of mineral collectors. By paying a visit to your local museum, or purchasing such a list as Dana's *Catalogue of American Localities of Minerals,* one may speedily learn what to expect.

Once in the field, one must keep a sharp eye out for likely specimens. Veins should be followed up, for in the cavities splendid crystals are frequently found. Quarry and mine dumps are excellent hunting ground as just the mineral you are after may be the one the owner is discarding. In these piles minerals may be found with little digging. Large specimens should be trimmed down to the best advantage allowing for a conformable base. The standard American specimen size is 3½ x 2½ inches, and a specimen must be of extra quality to warrant larger dimensions.

Within a few hours of New York City are the world-famous Franklin, New Jersey, zinc mines. Here are found a score of minerals originally known only to this locality. Many of the finest fluorescent minerals that transform so gorgeously under ultra violet light are found in Franklin.

Another locality of well-deserved fame is the Tri-State District, which includes the corners of Missouri, Oklahoma and Kansas. This area has produced far more lead and zinc than any other, and is honey-combed with mines and natural caverns so that one may walk for miles underground and into three states without ever coming to the surface. Wonderful groups of golden calcite crystals; aggregates of lead sulphide cubes; brassy chalcopyrite sphenoids, and ruby zinc sulphide crystals abound in astonishing quality and variety.

Anyone contemplating a Nature trip to the West should certainly include Crystal Peak, Colorado, and the Virgin Valley, Nevada. I spent one of the most enjoyable days I ever expect to experience in the Crystal Peak area, and my heavy knapsack was full of valuable specimens.

Finally, a word to the youngsters who start early as amateur mineralogists. Field geologists, mining engineers, and mineralogical chemists who know their field have a definite economic asset. With new uses for strange metals popping up daily, fields are widening and rewards increasing for persons who know minerals. A hobby encouraged now may later lead to a vocation.

Geology is the foundation of this and other planets. Mineralogy is the foundation of geology. So—mineral collecting, why not?

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The Claim

By EUGENE JOSEPH

He who has beheld the south-bound flocks
Winging silver through the autumn smoke;
Who knew one sun shower's sky-lit paradox,
Or tramped a snow-packed wood and knelt to drink
Beside a pond that held the moon's bright yolk.

He who has stood poised upon a hill,
Inveigled by the strategy of spring
To breathe the green and bend his rigid will
To Nature's own, who, in the swift-swept rain
Felt swifter rhythms of the blood and brain,
Or heard with honest ears the skylark sing—

Has more of claim to life than merely breath,
And twice the right to dread the dust of death.

A Geological Round-Table

Which provides a suggestion in Nature education

By MAURICE BROUN

TEN MILES east of Rutland, Vermont, on the Long Trail that traverses the length of the Green Mountains, the tourist or hiker comes unexpectedly upon an impressive rustic building, the Long Trail Lodge, home of the Green Mountain Club. In this wilderness setting, Nature students are delighted to find a carefully planned system of Nature trails and exhibits, providing the visitor with a cross-section of the fauna and flora of Vermont.

One of the simplest yet most effective of these exhibits is the geological table. On the sign above it one reads: "The revolving table will tell you something concerning the rocks about you. It pretends to nothing more than a key-hole introduction to the historical geology of Vermont." And then, in fewer than 500 words, and with the help of a few labeled specimens of rocks, you get the gist of a subject otherwise difficult to "put over."

PHOTOGRAPH BY THE AUTHOR

"THE REVOLVING TABLE WILL TELL YOU SOMETHING CONCERNING THE ROCKS ABOUT YOU. IT PRETENDS TO NOTHING MORE THAN A KEY-HOLE INTRODUCTION TO THE HISTORICAL GEOLOGY OF VERMONT."

Methods of imparting worthwhile information never cease to intrigue educators. Nature instructors are particularly zealous in devising gadgets to arouse one's curiosity in a subject, and thus win attention. Fundamental psychological principles were adhered to, therefore, when the writer put together his "revolving geological table", which is, indeed, something of a gadget.

The table, arranged on a tripod, is prepared from a disk measuring about two feet in diameter; has three handles for turning; revolves on a bolt concealed under a three-sided pyramid. On the pyramid are three labels with the fundamentals of our story:

"ROCKS are part of the earth's crust, and ordinarily they consist of one or more minerals. There are three kinds of rock: *Igneous* rocks are those which were melted or have solidified by cooling. Their texture is crystalline.

"*Sedimentary* rocks are those which were laid down (usually) under water, by mechanical, chemical, and organic processes. They are seldom crystalline.

"*Metamorphic* rocks are those which have been changed from their original sedimentary or igneous character. Their texture is crystalline."

While you have read this, the table has necessarily made one complete turn, while specimens of the three kinds of rock have passed under your eye. Near the first face of the pyramid is fastened a piece of igneous rock—granite, from Barre, Vermont, and a label reading: "The characteristic minerals are quartz, mica, hornblende, feldspar, and magnetite. These may be detected with the naked eye as the texture of the rock is so coarse." A sedimentary rock, limestone, comes from Plymouth Union, nearby: "Limestones are composed of carbonate of lime in varying degrees of purity, hardness, fineness of grain, and of crystalline texture. Marble is metamorphic—limestone changed by heat to a crystalline rock." Lastly, a bit of metamorphic rock, schist, from the surrounding woods: "Very abundant, somewhat scaly rocks, which break readily and show the main component minerals, easily recognized with the naked eye. This specimen shows mica, chlorite (green), and quartz." Those who wish may learn more about such minerals as mica, chlorite, and quartz, at exhibits close by.

Meanwhile four hinged covers, marked A to D, have also passed under your eye, and you regard them questioningly. No doubt they conceal something of interest. Raising the provocative covers one by one, you find a series of neatly typewritten legends—the essence of our story. And so, still standing in one spot, your hands occupied as well as your eyes (one reason why the "gadget" appeals), the table revolves once more; your imagination is challenged with the following distillation (each paragraph a hidden label) of Vermont's geological history.

"Granite, limestone and schist are the dominant rock formations of Vermont. The low, broad valley west of the Green Mountains is made up of extensive limestones (or marbles). Our ridges are made up of hard crystallines —granite and schist.

"In early Paleozoic times, five hundred million years ago, most land was made up of granite—cooled-off, molten, igneous rock. There came an uplift of the land resulting from stupendous physical forces; our Appala-

chians formed. Then came a lowering of the middle part of the United States, and a great inland sea formed, bordered by our Appalachians. Most of our limestone originated in deep ocean bottoms.

"Erosion of the ridges in ancient times carried the fragment and powdered rocks to the ocean floor, where, hardening into layers (strata), they became sandstone and other kinds of sedimentary rock. Hence, sandstone was made out of the old, original, igneous rock. These layers of re-made rock form a substantial part of the earth's crust. In the course of ages these rocks have been raised by uplift.

"Some 400,000 years ago, so geologists tell us, the wobbling of the Pole, or some such phenomenon, started a great ice sheet to move down from the north. There has been a succession of glaciers, the last one occurring some 50,000 years ago. In some places the glaciers were a mile thick. These ice movements, dumping rocks and gravel here and there, have given us our present surface soil, and they have also etched the present matchless landscape of Vermont. Look for the glacial scratches on the surface of the big schist boulder on your right."

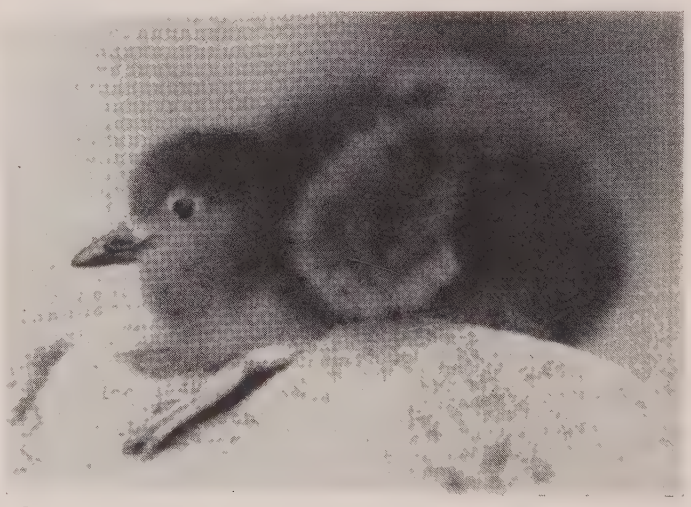
Thus our traveler in Vermont has sampled some geological meat in the proverbial nut-shell. If he has known nothing whatever about the subject, we hope that we have raised a mental window on new vistas, that his appreciation of the scenery about him is enlivened and that he will thus be led to learn more about our landscape.

•

Mysterious "Sea Quail"

By LEWIS and MARIAN WALKER

After twilight has faded into darkness, they start coming in; singly at first, then in numbers. With whirring wings, which are all too small for their bodies, they pass like bullets and slam against the talus slopes of the bleak Mexican islands, Los Coronados. Quick work with a flashlight after a seemingly bone-breaking landing will perhaps disclose a little-known bird of the Pacific—the Cassin auklet, as it scurries for its burrow.



YOUNG CASSIN'S AUKLET
Soon after hatching the babies are gray, fluffy balls of down, staying in the nest until well-feathered

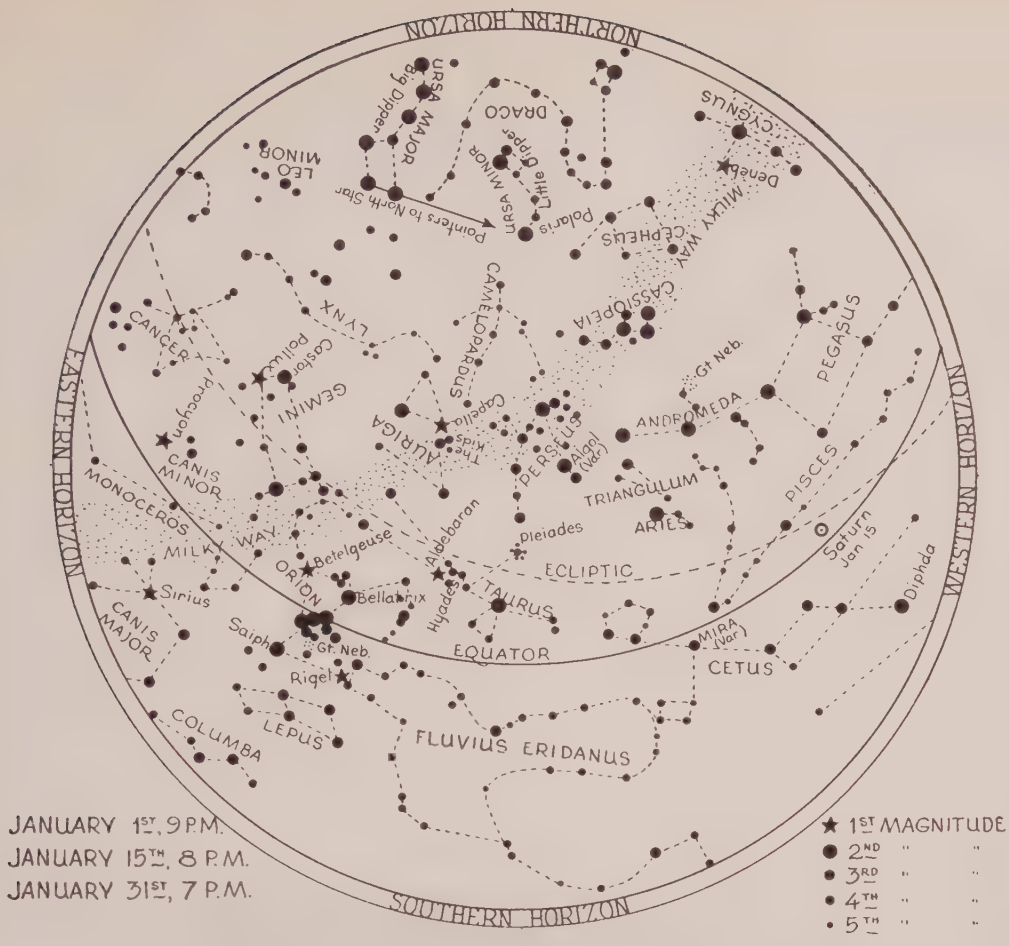
Comparatively little is known of these birds, which the fishermen so aptly term "sea quail". For nine months of the year their lives are spent far at sea, rarely within sight of shore. Like landlubber quail, barely hopping the brush, these tiny mariners just skim a roller or two to escape an oncoming boat.

As April nears, however, an egg starts to develop, an egg so large that its weight almost costs the parent bird the power of flight! A take-off is made with difficulty, and then only from the crest of a wave, never from the trough. Thirty days before the breeding season they have been seen hundreds of miles from the nearest land, riding the ocean swells and reaping a living from the plankton that the sea bountifully supplies.

Landward they must travel, however, and this should be a terrifying experience to them if they could but look into the future. Their webbed feet, made for swimming, are set well back near the tail. Hence, to walk is to shove, with the breast as a plow. Once on land they head for the base of a boulder, or, perhaps, in their headlong flight they hit the boulder and fall to the base automatically. At any rate their burrows are most often found running horizontally under a large rock or cliff side. Here at a depth of from two to four feet, a slight chamber is excavated, and on the bare dirt floor the single white egg is deposited, oval in shape and almost two inches in length. The total length of the parent is only eight or ten inches.

All trips to and from the nests are made at night. This rule seems to be infallible. In months of time spent on the Pacific islands, we have never seen one in daylight of its own free will.

The young soon after hatching are gray, fluffy balls of down, and stay in the nest until well-feathered. When home ties are finally broken they start off down hill. Over rocks, through cactuses, under bushes—always down, until the turbulent sea is reached. They never seem to have a parent convoy on these perilous journeys, but appear to be completely on their own. Perhaps, on reaching the ocean, they can fare for themselves, or families may be reunited far at sea. We do not know. Once they leave the island, these rare birds with their distinctive white eyes become just "sea quail", usually seen at a distance, with most of their life history still an intriguing mystery.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Heavens in 1939

By ISABEL M. LEWIS

WHO can tell what unexpected celestial phenomenon may be awaiting us in this newest year? What unknown comet may be speeding along in its orbit toward perihelion, or from what nova may the light waves be now approaching our solar system, to announce a great celestial catastrophe that may have happened hundreds or even thousands of years ago, but of which the news has not yet arrived? Who suspected last January that before the year 1938 had ended Dr. Seth B. Nicholson of the Mt. Wilson Observatory would discover two more small moons belonging to the family of the giant planet Jupiter, compelling students and teachers of astronomy to make note of the newly discovered celestial mites, probably not more than fifty miles or so in diameter, which were detected on photographic plates exposed in July? This discovery puts Jupiter two ahead of Saturn in the number of known members of their satellite families, although Saturn has the distinction of possessing countless tiny moonlets in his unique ring system.

Such happenings as we have mentioned above are unpredictable, but there is a large class of celestial phenomena whose occurrence can be predicted with as much certainty as we can predict that the sun will rise tomorrow morning. In this class fall the eclipses of the sun and moon, the occultations or, literally, "hidings" of stars and planets by the moon, the returns of periodic comets, and the apparent wanderings of the planets against the background of the stars. Such phenomena, as well as the conjunctions and oppositions of the planets with the sun and their conjunctions with each other and with the moon, are easily predicted in advance from our knowledge of the laws that govern the motions of these bodies in their orbits.

One may also make predictions regarding the activity of the sun in a general way during the coming year, as manifested in the outbursts of sunspots and their effect on the earth. One may say with reasonable certainty that the peak of the sunspot maximum period of intense solar activity has been passed for this cycle, and that there will be a decrease in the total number of sunspots, or sunspot

groups, observable during the coming year. The appearance of occasional groups of exceptional size, with accompanying effects upon the earth's magnetism, auroral displays, cloudiness, rainfall, and other phenomena, may be expected this year, although to a less degree than last year, for the sunspot maximum period is still with us even though its peak has passed.

There will be, in the year 1939, four eclipses, two of the sun and two of the moon, an annular eclipse of the sun on April 19, a total eclipse of the moon on May 3, a total eclipse of the sun on October 12, and a partial eclipse of the moon, which lacks only about one hundredth of one per cent of being total, on October 28. This last eclipse will be visible in all parts of North and South America, and in parts of Europe, Africa, and Asia, and the Atlantic and Pacific Oceans. The total eclipse of the moon on May 3 will not be visible on the continents of North and South America, except in Alaska. It will be seen in the Pacific, Indian and Antarctic Oceans, Australia, Asia, Africa, and eastern Europe.

The annular eclipse of the sun is so named because, as viewed within the path of the annulus, the sun is covered by the moon except for a narrow ring, or annulus of light, at maximum eclipse; it is not of any special scientific value, because the solar corona and all other phenomena that are the object of scientific study at a total solar eclipse are not present in this type of solar eclipse. It is, however, an interesting celestial event and the path of the annulus will pass over the Aleutian Islands and part of Alaska south of Fairbanks. It will also pass over the polar regions. The North Pole, in fact, will be exactly on one edge of the path of the annulus. The duration of the annular phase of the eclipse in the middle of the path will be about 110 seconds. Large partial phases of the eclipse will be visible in Canada and the northern part of the United States, and smaller phases southward to the southern limit of the eclipse, which passes through Mexico, the Gulf of Mexico, and the northern part of Florida. Partial phases of this eclipse will also be visible at or near sunset in western Europe.

The total eclipse of the sun on October 12 will be observed as a small partial eclipse in the southeastern part of Australia, New Zealand, the South Pacific and the extremity of South America. The path of total eclipse, which will lie entirely in the Antarctic Ocean and will touch no inhabited land, may be unobserved by man. The maximum duration of the total phase will be only 92 seconds.

When we come to consider the motions of the planets among the constellations in the course of a year it is helpful to keep in mind the fact that the outer planets move much more slowly among the stars in the course of a year than the nearer planets—Mercury, Venus and Mars. We will not concern ourselves here with the motions of the planets Uranus, Neptune, and Pluto, for the two latter planets are faint telescopic objects, and Uranus is just at the limit of visibility to unaided vision and cannot be recognized unless one knows exactly where to look for it. We may say in passing, though, that so slowly do these planets move through the heavens that for the entire year of 1939 Uranus will remain in Aries; Neptune will be close to the boundary between Leo and Virgo, remaining within a few degrees of the bright star Beta in Virgo throughout the year, while Pluto will be found only a few degrees from the position in which it was discovered in Gemini in 1930. Its yearly motion is only one and a fourth degrees.

Saturn, the most slowly moving of all the bright planets, will be found at the beginning of the year in Pisces and will remain in that constellation throughout the year. It will be in quadrature with the sun on January 2, when it will be due south at sunset. It will remain in the western evening sky until April 11, when it will pass to the morning sky. It will be visible all night at time of opposition on October 22 and will continue to be visible in the evening to the end of the year.

On January 1 Jupiter is in Aquarius; it passes into Pisces in April and remains in that constellation for the remainder of the year except for a few brief periods when it crosses the boundary into Cetus. It remains in the evening sky until early in March, when it passes to the morning sky. It is in opposition to the sun and visible all night on September 27, and is due south at sunset December 22.

Mars starts the year in the morning sky in Libra. The planet is now rapidly approaching the earth, and on July 23 will occur the most favorable opposition of this planet since that of August, 1924. The exceptionally favorable oppositions of Mars occur every fifteen or seventeen years, and the planet is then seen at its best. In 1924 Mars came within less than 35,000,000 miles of the earth. When nearest the earth, on July 27 of this year, Mars will be at a distance of 36,000,000 miles. This is closer than the planet will be again for fifteen or seventeen years. It will surpass Jupiter in splendor this summer. The best observations of the planet will be made in the southern hemisphere because it will be far south at that time in the constellation of Capricornus.

Venus is a Morning Star at the beginning of the year, just past its greatest brilliancy, and will be at its greatest distance west of the sun on January 30. It will remain in the morning sky until the date of its superior conjunction with the sun on September 5, and will be an evening star from then on to the end of the year. Mercury will be best seen in the morning sky on or near the dates of its western elongations, which will occur on January 3, May 1, August 28, and December 16, and will be seen to best advantage in the evening sky on or near eastern elongations on March 16, July 13, and November 7.

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Michigan Club

Humphrey A. Olsen of 172 Manchester Street, Battle Creek, Michigan, is the moving spirit in the Mountain Book and Nature Club, which is for persons interested in the southern highlands of Michigan. We have mentioned Mr. Olsen and his Nature work before in our pages, and space does not permit a detailed description of this latest activity. A note to Mr. Olsen will bring you those details.

East African Birds

Acquisition of a collection of 6640 birds of East Africa has been announced by the Field Museum of Natural History. Over a period of twenty years Sir Frederick J. Jackson, who served as lieutenant-governor of Kenya and governor of Uganda, assembled this collection, which includes more than 600 species. With it are three volumes of notes and observation on birds.

Good Reading

Testifying to its value, *Good Reading*, a booklet published by the Committee on College Reading of the National Council of Teachers of English, has gone into its fifth edition. Its value is not confined to the college campus but will be valuable to any adult reader. The references are classified by subject and indexed by author and by title as well. Copies are available for twenty cents each from the National Council of Teachers of English, 211 West 68th Street, Chicago, Illinois.

Mosquitoes Test Poison

Mosquitoes that are a help instead of a nuisance are reared in entomology laboratories of the United States Department of Agriculture. Larvae of the insects are used in rapid and economical tests of the comparative poisoning power of various lots of pyrethrum flowers. The mosquito test is not so precisely accurate as a chemical analysis, but is quick and accurate enough to distinguish between good materials and poor ones.

Pyrethrum flowers, dried and ground fine, have long been used as a household insect powder. Steeped in a solvent—usually kerosene—pyrethrum is the poisonous material in many fly and insect sprays. It has possibilities as a field insecticide. At present most of the pyrethrum is imported, but the Department of Agriculture has been experimenting in hopes of breeding home-grown strains of highly poisonous pyrethrums. Department workers are also trying to develop practical methods of machine harvesting that will make pyrethrum a practical farm crop.

Pyrethrins are the poisonous chemicals in the flowers of this species of chrysanthemum, which is distinct from both the garden chrysanthemums and the garden plants known as pyrethrums. By extracting these poisons from a carefully weighed sample of the flowers and then diluting it in water, the laboratory workers prepare a standard test solution.

With pyrethrum of average strength this will kill part, but not all, of the mosquito larvae which are dropped into the test bottle. If the material is low in poison, most of the larvae survive; if strong, most of them are killed.

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THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Junior High School Science

School science of the seventh, eighth and ninth years has probably seen more changes in the last thirty years than that at any other grade levels. There was a time when teachers in this field preferred to spend long periods considering intensively restricted fields of science instead of the present practice of trying to cover all fields as rapidly as possible. Only the rank partisan would fail to recognize that there is merit in each system.

Some of the arguments advanced for the introduction of the present-day general treatment were that students of these years needed a more functional and less academic science than they got in physical geography, for example; that teachers of the day were not prepared to teach well any one science; and it was hoped that the new survey type would lead to a recruiting of a greater proportion of students in the advanced science courses than had been the case in the past. Other objectives were advanced, but these alone can be considered on this page this month.

Is the academic and functional nature of present-day junior high school science satisfactory? For the sake of convenience let us consider this from the angle of the treatment of wildlife problems. A half dozen general science texts written fifteen years ago give no consideration to this problem. Some elementary zoology texts, which preceded them, give this topic no consideration. Of a half dozen of the most recent general science texts the term conservation does not appear in the index of half of them, and in one where it does appear the treatment deals solely with the laws of conservation of energy.

The text that gives the most adequate treatment is a distinct step in advance of the others. Approximately 1/34 of the text deals with conservation problems, but every bit of it is academic. The pupils are asked to *discuss* the problems of bears in our National Parks and how landlocked salmon got their names. The pupils are asked to *read* descriptions of ancient pigeon-trapping practices and make a special study of the whaling industry. Immediately after studying the whale the students are asked to make a special study of the migratory habits of "some other fish".

There is some suggestion that the students learn the local game laws and try to understand them, and there is a good treatment of the philosophy of wildlife protection, but not one suggestion that the pupils do anything about it. There are no suggestions for providing cover and food for local and hard-pressed forms of wildlife; no recommendations that the students organize public sentiment for the establishment of local sanctuaries; no plans showing how boys can help to improve a trout stream to see these species through critical periods; no suggestions as to how students can conduct local population surveys that may serve as a basis for determining the "take" of local wildlife. Many of these things are within the abilities of these students and would prove more interesting than the academic philosophy presented. We need not here comment on the wisdom of teaching in the junior high school that whales are fishes and presumably having to correct this statement later on.

It is true that much that has been offered as junior high school science is less academic than some science offered at this level early in the century, but it is doubtful if at present the pendulum is swinging away from the academic mental gymnastics type. One reason for this may be that the offerings of the newer general science texts are increasingly comprehensive, and that this crowding of subject matter forces an academic treatment to be substituted for the experimental method. It is doubtful to some if this is to be desired. It is true that such a procedure may make it possible for a larger proportion of the students to have some *knowledge* of more science than was formerly the case, but it may be questioned whether this knowledge is of the functional type and if knowledge should be the only goal sought at these levels.

Corrigan, the world's champion backward flier, writes of his experiences with the Boy Scouts when he was at the junior high years saying that he did not get "much fun out of it because it was almost like school". He adds that when he had to "make a fire without matches, make a meal without food, and even make haste without hurrying" he gave up. It would seem that this comment of Corrigan's might well be applied to much that is offered as science in our junior high school texts and may account for the fact that so many students "give up" after the initial experiences they get in this field at this school level.

Are teachers as well prepared to teach general science as to teach the special sciences? Even though this topic will be treated more exhaustively in a subsequent article, it is essential to an understanding of junior high school science that some consideration of teacher preparation be given here. It should be obvious to anyone with common sense that to teach well in the field of general science would require a broader training than to teach well in any of the specialized fields, unless of course the offerings of the course may be limited to the content of one or a limited number of texts.

It is strange to say that not only are the certification requirements to teach general science commonly less than those to teach the special sciences, but the junior high school teacher is probably more likely to have to teach outside the science field as well. These circumstances force the teacher of junior high school science to rely more and more on the text and thus defeat one of the important arguments for the introduction of general science. No one except an out-and-out slave to the doctrine of formal discipline would question the superiority of the ideals of general science. There are some who recognize difficulties which are not being met satisfactorily at present by the methods in vogue for the selection and training of teachers, and by the methods used in selection and presentation of subject matter.

Has the introduction of the new junior high school general science led to a proportional increase in enrollment in the special sciences in the later years? Since one of the reasons advanced for the introduction of general science was that it might serve to recruit more workers in the field of science and a better understanding of everyday science problems, it might be well to look at the enrollments. It is true that there are more high school students taking science now than was the case before general science was introduced, but it is also true that there are more high school students than there used to be.

The proportion of students taking the specialized sciences has not increased in keeping with the proportion taking those of a general type. While in a recent ten-year period the enrollment in general science in New York schools increased more than 560 percent, the enrollment in physics increased 86 percent, chemistry, 110 percent, and physical geography, 168 percent. Enrollment in elementary biology increased 23 percent during this period. The percentage increase of all students taking high school science during this period was 130 percent, so it should be obvious that, in New York State at least, the adoption of general science has not served phenomenally as a recruiting agent for the specialized sciences. In New York State the general biology field showed the greatest increase, the percentage being 1077 during the ten-year period, but with this increase the enrollment in the specialized fields of zoology, botany and physiology dropped to a negligible figure.

It is not the function of this article to attempt to interpret these figures, but merely to present them as facts. It is hoped that it will be recognized that the writer does not think anything is fundamentally wrong with the idea of general science, but that he feels that general science as it is now being taught is not serving as an important agent in drawing more students into the science field; that its problems are not being solved with the present certification standards so far as teachers are concerned; that it is certainly not less academic and bookish than some of the high school science it has supplanted. Whether this is all for the better depends upon one's viewpoint.

The result of years of experience with teachers and pupils, NATURE MAGAZINE'S *Guide to Science Teaching* is a valuable aid to teachers of natural science. It is designed to develop an honest, critical, open-minded, impersonal habit and spirit of inquiry that recognizes the relationship between cause and effect and looks to proof for authority rather than to authority for proof. Drawing upon the wealth of material that has appeared in the pages of NATURE MAGAZINE during the past fifteen years, this manual has been checked, criticized and supplemented by leading educators in this field. Copies are available from the American Nature Association, 1214 Sixteenth Street, N.W., Washington, D. C., for twenty-five cents each.

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Chrysanthemum Breeding

Chrysanthemum breeding still is less a science than an art. Scientific investigation of the genetics of chrysanthemums is in its early stages, but the breeder's art has been known at least 2000 years in China, 1000 years in Japan, 250 years in Europe and nearly 150 years in this country, says Dr. S. L. Emsweller, of the United States Department of Agriculture.

Some improved varieties come from mutations of older stocks. Chrysanthemums may be propagated easily, and growers can readily multiply the stocks of these desirable plants. In the main, says Dr. Emsweller, breeders have developed many new types by crossing old varieties and selecting the best of the offspring. Cross fertilization of promising plants was likely to produce seed from which would grow many inferior seedlings and, perhaps, a few superior plants.

Breeders knew by experience that an early flowering habit in one or both of the parents was likely to produce some early flowering seedlings; that large-flowered parents were likely to breed large-flowered offspring; and that hardiness begets hardiness in at least part of the seedlings.

The result of this kind of breeding is that most of the good chrysanthemums now in cultivation have highly mixed ancestry. One variety of known parentage is the result of five generations of the crossing of known hybrids. Thus it has a mixture of the characters of 10 known varieties and these probably include genetic elements from hundreds of earlier plants.

Until scientific study of chrysanthemum genetics makes progress, it will not be practical, according to Dr. Emsweller, to "breed to order" for specific combinations of chrysanthemum qualities. He suggests that there is a promising field both for research and for commercial breeding in "selfing" some of the present varieties to isolate strains that will breed true for at least some of the hereditary characters.

A Cactus Book

There is an audience waiting for *Cacti for the Amateur* by Scott E. Haselton, editor of the *Cactus and Succulent Journal* and authority on these plants. Treating with the allure of cactuses, the building of a collection, culture, growing indoors and outdoors and other details, this book has both practical and scientific value to anyone interested in these growths. Profusely illustrated in black and white, with a spread of 110 colored pictures in small size of cactuses, and with 142 pages, this book, bound with a heavy paper cover, sells for only one dollar. It may be had with board covers for fifty cents additional. No cactus enthusiast can afford to do without it, we should say. It is published by the Abbey Garden Press, Pasadena, California.

Ohio Wild Flowers

In size and plan a notably handy guide, *Wild Flowers of Ohio* by Harold L. Madison has been published by the Cleveland Museum of Natural History, 2717 Euclid Avenue, Cleveland, Ohio. Arranged with brief descriptive text on the left-hand page and line drawings of the flowers described on the right-hand facing page, this book is designed to slip into the pocket for trips afield. There is a careful index and glossary. The price is $1.50.

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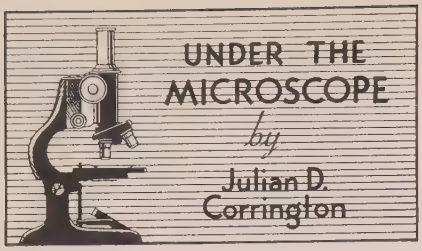


Let There Be Light

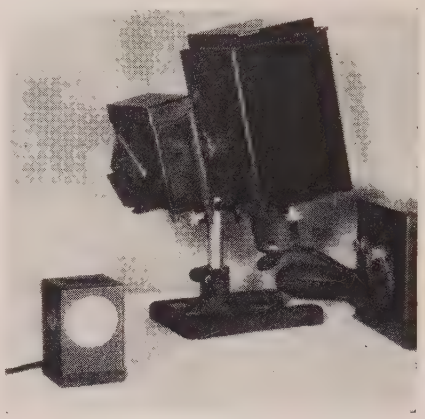
One uses a microscope in order to gain knowledge about some specimen under observation and so the microscope, together with its many accessories, is to be regarded as a tool—a means to an end and not an end in itself. Results, however, can be no better than are permitted by the quality of the tools employed, hence a vast amount of research has been done on improving and adding to these tools. As these have become more and more highly perfected, knowledge of the structure of matter has steadily increased. Hence the optical worker has played a prominent part in the advancement of learning.

Of all such tools the microscope itself is naturally of greatest importance. The microscope, however, being an aid to vision, requires light in order to function, and no accessory in microscopy needs more consideration than the source of illumination.

The average person familiar with routine pictures of the microscope thinks of using daylight, or an electric lamp whose rays are reflected by a substage mirror through a transparent specimen and thence through the lenses to the eye. Although the obvious ones, these are by no means the only methods of illumination. In later articles we plan discussions of how scientists have learned to use reflected light, directed upon the specimen from above, and, lately, to employ polarized, infra-red and ultra-violet lights, and dark-field microscopy; indeed they have had to conduct many exhaustive studies on the very nature of light in order to design proper optical systems for particular purposes. For the present attention will be directed to lamps as sources for bright-field microscopy, using transmitted white light.

Some workers consider daylight superior to any artificial source. This should take the form of diffuse light reflected from a white cloud and in no case should direct sunlight be employed. However, studies may have to be made in cloudy weather, in a room where good daylight is not always available even in good weather, or at night. Hence many microscopists prefer artificial light at all times because it is always the same and always on tap. Especially is this so since the introduction of a blue glass, which gives true daylight when used with a nitrogen-filled Mazda bulb. For very high power work and for projection the arc lamp is often used and is then generally provided with an automatic feed for the carbons.

Commercial microscope lamps are available for every purse and purpose, the simplest being the small rectangular metal box with a single round glass window, termed a substage lamp. It may be stood in front of the mirror and used with it, or the mirror may be swung aside or removed and the lamp placed on its back directly beneath the types of microscope having a horseshoe base.



TWO EXTREMES OF MICROSCOPE ILLUMINATION; LARGE RESEARCH LAMP WITH 108 WATT BULB AND SMALL LAMP FOR ORDINARY WORK. BELOW, A HOME-MADE MICROSCOPE LAMP

One of our illustrations shows a home-made microscope lamp that can be manufactured by anyone having the smallest familiarity with tools and at practically no expense. The top of a small tin can is discarded, the label soaked off, and the outside of the can polished with fine sandpaper. With an old knife or sturdy scissors, cut a circular hole in the bottom center of the can, a trifle smaller than the threaded end of a lamp socket—the part ordinarily designed to support a shade holder. The can will then engage these threads and is screwed to the socket.

From another tin can cut a strip to wrap around the waist of the socket, above the threads, with a half-inch to spare at each end. Punch holes through these tab ends to receive any small size of bolt that may be at hand. A short length of brass curtain rod is now filed flat at one end and drilled to take the bolt; then place this hole between the two tab ends of the sleeve strip, run the bolt through the three holes and tighten with the nut, thus holding the lamp securely at any desired angle.

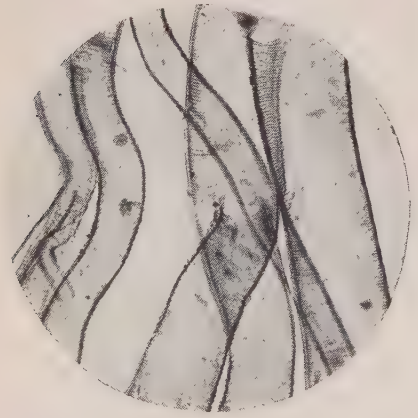
The base may be made round, square, or in any preferred shape, of fairly heavy wood, such as the end piece of an orange crate. Sand it to secure a smooth finish, then drill a hole just large enough to receive the brass rod in a tight fit. After wiring the socket and inserting a 25-watt opal bulb, the lamp is completed as it looks in our illustration. Both base and lamp (outside only) may be painted. It is not at all difficult to rig up a holder at the open end to support a slab of daylight glass, a bull's-eye condenser, or a color filter as used in photomicrography, but if this is done drill some holes around the upper end of the can for ventilation.

Stand the lamp directly in front of the microscope, about six inches away, and, looking through the tube, adjust the mirror until the whole field of view is brightly and uniformly illuminated, with no shadows or bars of any sort. Use the plane mirror if a condenser is employed, or, in all cases, with high power; use the concave surface for very low power, or without condenser, or for focusing on distant light sources.

If the microscope is equipped with a condenser, rack this down until the image of the light source appears in the same view and focus as the object being examined; then rack condenser downward just a trifle farther, until such image disappears. Now remove the eyepiece and look down the tube. Operate the iris diaphragm until, while closing it, the back of the objective lens is seen to be just filled with light and no more. Replace eyepiece. The light is now in that condition termed *critical illumination,* ideal for most work.

Some of the earliest workers with lenses discovered the principle that all light coming through the microscope to the eye should pass through the specimen. Any rays which sneak by the sides and enter the tube without going through the specimen are not only useless but harmful in that they fog the image; hence the use of a condenser to concentrate the light rays where they are wanted, and of an iris diaphragm to cut out those at the sides.

If no condenser is present, various devices

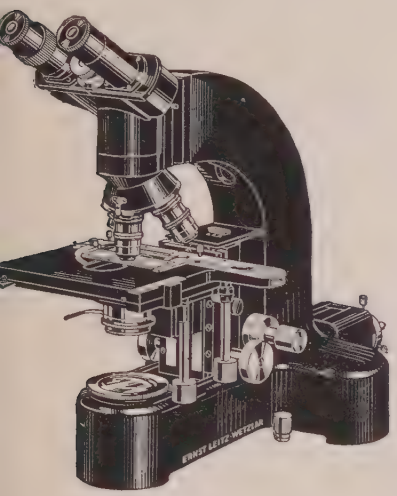


TRACHEA OF INSECT WITH CRITICAL ILLUMINATION GIVING LESS DEPTH OF FOCUS BUT A TRUE PICTURE WITH DETAIL

TRACHEA OF INSECT WITH OFF-CENTER ILLUMINATION. DETAILS FUSED TOGETHER, DIFFRACTION RINGS GIVING FALSE PICTURE

ay have to be tried to cut down the light. may be moved farther from the micro-ope, or may be dimmed with a translucent reen, such as one of light blue tissue paper, a round flask of water containing a solu-on of copper sulphate. Another method is make a very small hole in a piece of black notomount paper and paste this on the un-r side of the microscope stage with the le accurately centered as an aperture for e light; this will cut down the light and ve a picture of much greater detail.

Remember these rules: the higher the wer, the stronger the light required; the rger the aperture, the greater the fogging d glare and the less detail to be observed; d finally, never use more light than is nec-sary to see distinctly without strain. Addi-nal light will not only harm the eyes but ll drown out detail in the object.



Leitz Announces new Research Microscope

The accompanying illustration shows the w Leitz microscope *Ortholux,* a model in-ving many new departures in microscope nstruction and one that may properly be med the last—or at least the latest—word the manufacture of microscopes. The stand of the newer "reversed" style, with the ge facing the observer, and is the first to ude a built-in, permanently aligned illu-nating system of variable intensity for both nsmitted and reflected light. Coarse and adjustments are at the base of the stand d actuate the stage instead of the tube, the es remaining stationary. Stage movements ude horizontal as well as vertical direc-ns and operate on ball bearings.

The binocular body is removable and a nge to a monocular body for photomicrog-hy is a simple operation; also transition m bright to dark field requires but one er action, without change of focus, and so s the change from transmitted to reflected ht, the latter employing the well known tz Panopak.

The substage by Berek incorporates many ful new features, including two iris dia-agms, a swing-out lens component, a cen-ing mount and accommodations for light ers and polaroids. Illumination of every t is uniform under all conditions and there pears to be nothing that the manufac-ers have overlooked, simple operations hout disturbing mount or focus caring for ry known contingency or condition of ob-vation.

For full details and prices address E. tz, Inc., 730 Fifth Ave., New York City.

Surprise next Month

We won't do any more at this time than let slip a very gentle hint. Make a special note to watch for the February rotogravure section—you'll be surprised! There's to be something of unusual interest to all you microfans and valuable for the teachers of science and general biology, physics and history.

Photomike Contest

Some excellent entries have accumulated by this time, but the winning picture was not difficult to select and is reproduced herewith. The subject is the proboscis of the drone fly and the photo was made by Earl Plunkett, 67 Cathcart St., London, Ontario, Canada, who receives the prize award for this month. Definition, composition and lighting are all perfect. Made with an old Rochester camera, 4 x 5 plate, without lens; Bausch & Lomb Model R microscope with single objective; 60 watt light, Kodak filter No. 13, exposure 13 seconds; panchro press film.

Second place goes to Miss June Lord-Wood, Glenolden, Pa., for a very fine shot of a female Daphnia with eggs, and third place to Simon Truman, New York City, for his photo of cells of onion skin.

A Correction

Through an error of unexplained origin, the framed formula in the November issue received the wrong title. Instead of reading *Grenacher's Dilute Hæmatoxylin,* as printed, it should have been *Grenacher's Borax Carmine.* Please make this change if you are saving these formulas.

Club News

Amateur microscopists of Lowell, Massachusetts, belong to the Leeuwenhoekian Fellowship, a small group of intensely interested students. We very much like the name they have chosen, even though its spelling and pronunciation seem formidable to the uninitiated. Do you know Antony van Leeuwenhoek? We're preparing shortly to tell you all about him in our *Historical Outline.* The President this year is Vincent Kehoe, while R. J. Allen is Secretary and Elmer Lord is

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Treasurer. All those living in this vicinity who would like to know more about this club should address the secretary.

•

Biology students especially interested in microscopy at Blackburn, Oklahoma, have organized a club under the leadership of Superintendent of Schools Wick G. Beckham, who is also their instructor in biology.

•

Both of these clubs are keenly interested in the proposed organization of a national society of amateur microscopists and are working hard to enlist the cooperation of others in their respective vicinities.

National Society

Business is picking up a bit and it begins to look as if we will have enough returned questionnaires before long so that plans for the initial organization may get under way. At any rate, if you readers who have already sent in your sheets will be patient one more month, and if those who are interested but have neglected to take any action will do so immediately, we ought to have a definite report to make in the February issue.

In case you are not familiar with the proposal, see the October, 1938, issue for full particulars, and drop us a postal card if you want one or more questionnaires.

Euglena viridis

In the June, 1938, issue of the *Mendel Bulletin,* quarterly publication of the School of Science, Villanova College, Villanova, Pa., appears a very instructive article on *Euglena* by Sister Mary Adelaide, B. S., of the Sisters of St. Francis, of Oldenburg, Indiana. Permission to extract some of the main points for readers of *Under the Microscope* has kindly been granted by the author, and by the Rev. Joseph Dougherty, Moderator of the *Bulletin.*

The purpose of the paper is to discuss methods in presenting the structure and activities of this single-celled organism to classes in introductory biology, botany or zoology and we expect that teachers will be especially interested, although the amateur microscopist who specializes in protozoology will find much of value in this condensed summary.

Euglena viridis is the commonest species of its group and may be collected from greenish ditch or pond waters in great numbers. Sister Mary Adelaide tried out many culture media, including sugar solutions, hay and dried leaf infusions, and potato bouillon, but finds none better than pea soup medium. One formula for this is: place 5 grams of timothy hay, 10 halves of yellow split peas and 10 wheat grains in a liter of water; boil, then set aside until the next day. Inoculate with euglenae and use glass battery jars as containers.

To demonstrate structure in the living organism one needs to slow down these very active cells and this is accomplished by placing one drop of culture on a slide, then adding one drop of a salt solution before putting on the cover glass. Any of the following salts may be used: .53M NaCl, .3M $CaCl_2$, .53M KCl, .3M MgCl, .3M K_2SO_4 and .53M KNO_3. To explain these measurements, .53M means .53 grams of the salt per liter (1,000 cc) water.

These salts eventually produce death but before doing so initiate those curious writhings known as euglenoid movements, without any forward progression, and make the flagellum, reservoir and contractile vacuole more easily seen. The moving flagellum is best observed with dark-field illumination, but staining methods that kill the cells are also useful. Place the euglenae in a one-half to one percent osmic acid in water (caution: highly poisonous!) for three to forty-eight hours, then mount in dilute glycerine and study under an oil immersion lens. This reagent demonstrates the bifurcation of the flagellum and termination of the two branches of this whiplash in two blepharoplasts; also brings out the reservoir and gullet.

Iron hæmatoxylin is recommended for the nucleus, showing its granular network and central spherical nucleolus; also for pyrenoids, paramylum bodies and chloroplasts. If the chloroplasts cannot be seen as separately distinct in living cells, the author recommends changing some specimens from a pea soup to a potato bouillon medium and within a few days the desired result will be accomplished.

Euglena reproduces only at night, but Sister Mary Adelaide found that inducing reproduction for class work during daylight hours was not difficult and worked on the same principle as fooling hens to lay eggs at night. Keep a culture beneath an artificial light all night, then in the morning transfer the vessel to a dark room or cover with black paper. Maximum reproductive stages will occur in five to seven hours after this change and may be studied with ease by elementary students when the culture is again brought into the laboratory, timing the procedure to fit the laboratory schedule. Pipette specimens from the bottom of the culture dish as they have lost their flagella and are lying quiescent on the bottom.

Encysted stages may be scraped from the sides of a culture jar or pipetted from the bottom; the solid residue in a jar after evaporation of the fluid contents will contain many cysts; but the surest method is to place a small amount of a prolific culture in a test tube and add twice that amount of any of the previously described salt solutions. The euglenae survive for several weeks but all encyst in the course of time and form a green mass of debris at the bottom of the tube.

Now place some cysts on a glass slide and add a drop of culture medium. Excystment may then be observed under the lens, evidence of life beginning with a slight agitation of the protoplasmic contents, followed by a slow circular movement. Some cells emerge singly, others divide either before or after leaving the old cyst. Depression slides are recommended, since the process may require thirty minutes or longer. By adding a small amount of a one-to-ten dilution of saliva to the culture medium used in this experiment, excystment may be produced in as short a time as ten minutes.

The author concludes with several experiments on the behavior of these cells, including their well-known reactions to light and describes white euglenae produced by rearing a culture in darkness, the chlorophyll degenerating to reddish-brown granules. If you enjoy working with living material we recommend some of these exercises with euglena, the plant which zoologists claim as an animal—or is it that animal which botanists term a plant?

Trade Notes

As soon as you have advanced to the point where you are no longer a beginner, but can cut and stain sections and read technical literature with comprehension, there is one book which becomes indispensable and that is the famous Lee's *Microtomist's Vade-Mecum,* a complete handbook of methods in plant and animal microscopy.

The first edition of this important volume was published in 1885 and the present one, the tenth, in 1937. Arthur Bolles Lee (1849-1927) performed a difficult and highly valuable task for microscopists the world over when he brought together in a single book all of the approved technical methods from every nation, and the work now goes on under the editorship of Professors Gatenby (Trinity College, Dublin) and Painter (University of Texas) with the collaboration of a picked staff of specialists.

This is strictly an advanced reference work and contains 784 pages—an inexhaustible mine of terse information. This latest edition incorporates plant micrology for the first time and has been enlarged, with extensive revision and the addition of new chapters. P. Blakiston's Son & Co., Inc., 1012 Walnut St., Philadelphia, Pa. $9.00.

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On the other hand *Exploring With the Microscope,* by Raymond F. Yates, is a book which we can recommend only for youthful beginners. An attempt has been made to do away with technical language as far as possible—always a difficult operation—and to relate the experience of studying with the microscope to the sensational in modern life. The author is too often in a facetious mood for readers of maturity or advancement, yet with it all he is entertaining and provides useful and accurate directions for the simple and inexpensive manufacture at home of many accessories: substage lamp, turntable, microtome, slide dryer and even a water-drop microscope. D. Appleton-Century Co., 35 West 32nd St., New York City. $2.00.

•

In the November issue we announced for distribution a Leitz publication, *The Microscope and Its Application,* but due to an unexpected shortage were forced to send out a substitute, although no less valuable booklet, *The Microscope, Its Mechanical and Optical Construction.* It is anticipated that the *Application* will again be available by this time and if all those who wrote in before, as well as others who did not, will once more send in their three-cent stamp, a copy of this valuable booklet will be mailed. The *Construction* pamphlet is also still on hand. Address Julian D. Corrington, NATURE MAGAZINE.

•

A chemical element the average person hears little about but which is of vast importance is silicon (Si). The crust of this earth on which we dwell contains more silicon than any other element save oxygen. Most commonly it occurs as quartz, a mineral also known as silica, chemically silicon dioxide (SiO_2), the principal constituent of sand, sandstone, granite, clay and a host of other rocks and soils. Sands are mostly silica and glass mostly sand, hence the microscopist owes a special debt to the non-metallic element silicon. Sand for making optical glass must be especially pure and deposits of suitable quality are rare and highly prized.

Diana Thorne's

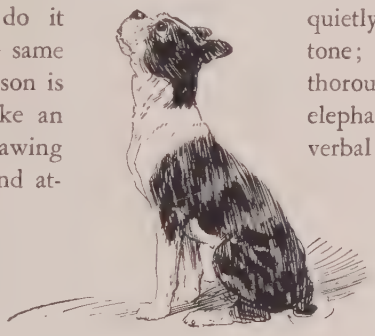
DOG COLUMN

TRAINING THE DOG

TO TRAIN an animal—and not to ruin his temper in that training—requires a degree of tact, patience, sympathy and understanding which is given to few individuals.

The first rule to remember is that a dog does not understand human language nless the sound of the word or words has from the first a definitely established lation to an object or an action. It's obviously useless to attempt to make an ani- al *understand* human speech! The most that can be attempted and undertaken the association of certain sounds with certain ideas.

Begin by teaching your dog the meaning of objects, and the meaning of the ound made by the word in relation to them. Thus to the puppy "leash", "collar", walk", "eat", "lie down", "beg", "roll over", "sleep", "come here", "be quiet", d such, are in the canine kindergarten. Repeat the ord several times, do it quietly and precisely and clear- and always with the same tone; always patiently, never asing till the first lesson is thoroughly learned. A dog, like a child, and like an elephant, never forgets! Never nfuse the dog by drawing verbal red herrings across the ail of his thoughts and at- tention. As you extend ur vocabulary with him, everything epends on your own patience and ability convey your ideas. He stands ready to ey and desires to know what it is you ant. Go slowly. Take



e step at a time and be certain of the dog's mastery. Avoid tiring or boring him. early all dog-trainers—all animal-trainers—give a reward when the pupil grasps point; also at the end of every lesson, this is a reward for attention and a re- inder that attention is expected at the next lesson. A bone, a biscuit, or a pat will equally well.

In housebreaking a dog—a matter hardest of all for a dog to understand—it y be necessary to punish him. This must be done immediately so that the dog ay know exactly why he is being punished. Never punish him when you are angry—or *because* you are angry. Neither is it necessary to use a stick or a whip, nor to hurt him. A tap with a folded newspaper is enough to bring home to his understanding the fact that he has displeased you. No dog ever whelped requires the discipline of a human reform school! Any emotional instability on your part will react on the dog to the point of destroying his faith and belief, and all your previous efforts at tuition will be ruined! The nervous and excitable dogs one occasionally

(Continued on page 55)

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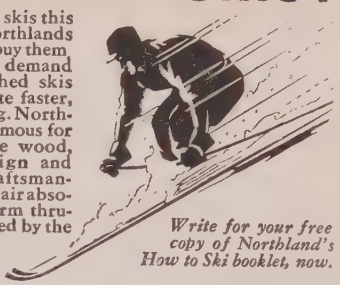

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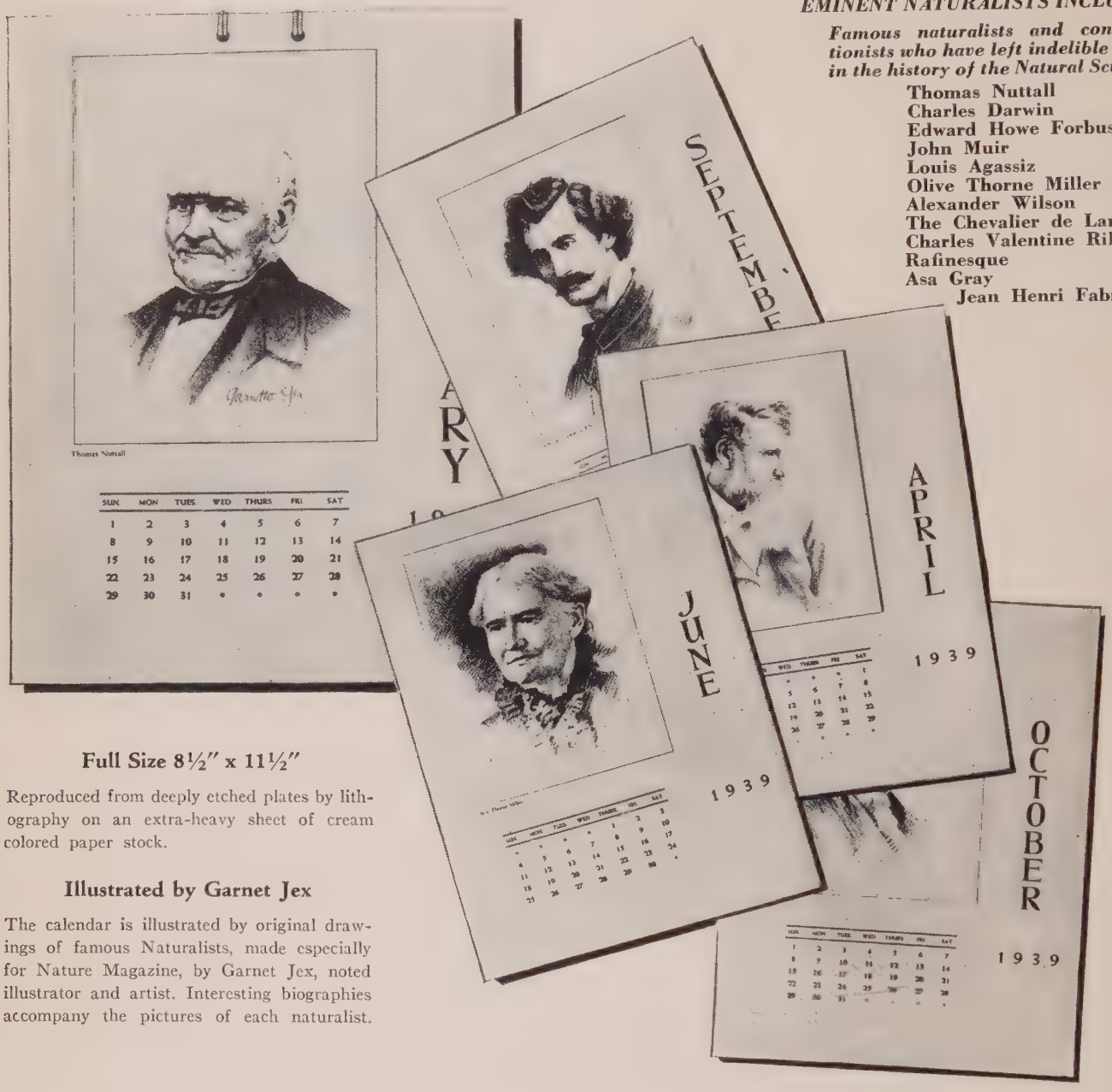

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Illustrated by Garnet Jex

The calendar is illustrated by original drawings of famous Naturalists, made especially for Nature Magazine, by Garnet Jex, noted illustrator and artist. Interesting biographies accompany the pictures of each naturalist.

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TRAINING THE DOG

(Continued from page 53)

sees are the unfortunate victims of improper schooling.

In Britain, where people are by nature and tradition and climate somewhat staid and even-tempered, even phlegmatic, one sees dogs obeying commands given in the low tone of ordinary conversation. As a consequence one is delighted, but not surprised, to see dogs allowed freely to ride in all public conveyances such as busses and trolleys, subways and trains. Never does one see a dog make the mistake of sitting on a seat or roving about. In goes the dog, be he alone or with his master, and promptly seats himself or lies down in a corner or under a seat, and there he remains, quiet and orderly. One sees restaurants with a dog under every third or fourth table. Never have I seen a dog misbehave! Never have I seen a dog fight! Never have I seen any cause for complaint by passenger or by diner. Never have I known of any complaint. Never have I heard of one. There are, of course, reasons—into which one need not go here—why, in America, this freedom is not possible for dogs. None of the reasons has anything to do with the dog! Many English characteristics and habits may be to us unpleasant, unfortunate, or uncomfortable, such as their archaic methods of house-heating. But British attitude to and training of the dog as a companion is a thing they can be proud of, and of which the dog-lover carries away affectionate memories.

(Continued next month)

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268-4th Ave., New York City, Dept. 225

The ASSOCIATION

Through its Secretary, the Association was represented at two important recent meetings, making addresses in furtherance of the Association's long-standing conviction that the rural countryside of America is no place for the billboard and ugly roadside enterprise. The first meeting was one called by the Federal Alcohol Administration to consider liquor advertising generally, including outdoor advertising of alcoholic beverages. The second meeting was that held in New York and reported on more fully on Page 33 of this issue.

Members of the Association able to do so will find much of interest if they attend the meetings of the Fourth North American Wildlife Conference to be held in Detroit the week of February 13. Headquarters of the Conference will be at the Hotel Statler and the sessions are open to the public.

Frequently we receive letters from members asking about our advertising policy, or commending the character of advertising in the pages of Nature Magazine. This is a subject of interest to all members, and a brief statement is pertinent here.

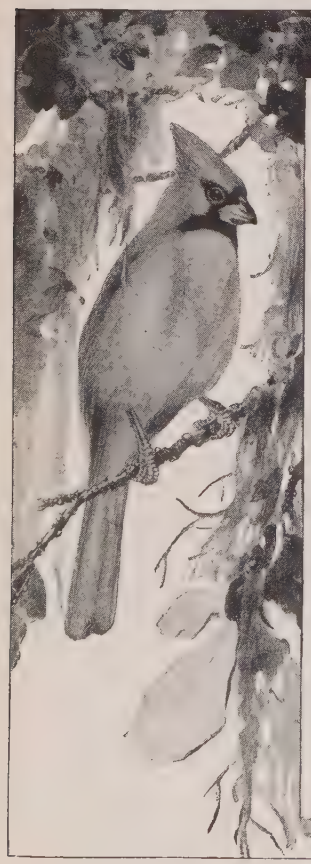
Most magazines depend upon their advertising to pay expenses and profits. Being non-profit making, Nature Magazine solicits certain advertising only in the conviction that it is of service both to readers and to the advertiser, and because some small income is derived from this source and applied toward the conduct of the Magazine and the Association.

No advertisements of cigarets or alcoholic beverages are accepted, not because the Association takes any extreme stand regarding smoking or drinking, but in the belief that such advertising would be at variance with the constructive purposes of the Association, and because Nature Magazine goes to many families and schools.

No advertising of arms and ammunition, animal traps, or other devices inimical to wildlife is accepted, because this would be definitely inconsistent with the Association's stand for the preservation and increase of wildlife. The Association is not opposed to hunting or fishing where they may safely be carried on without threatening the extinction of any native species, or seriously reducing the local wildlife population at the expense of those interested in its preservation for esthetic or economic reasons.

No advertisements of patent medicines or similar types of products are accepted, for obvious reasons. Every effort is made to determine the reliability of even the smallest advertiser.

Those advertisers who do help the Magazine and the Association deserve the support of our membership. While, in some cases, they are endorsers of our ideals as well as seekers of patronage, naturally they are primarily desirous of attracting the patronage of our members. Such patronage will definitely assist the Association in carrying forward its work.



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Date.....

Secretary, AMERICAN NATURE ASSOCIATION,
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I apply for subscribing membership in the Association and wish to receive NATURE MAGAZINE for one year. I enclose $3.00.

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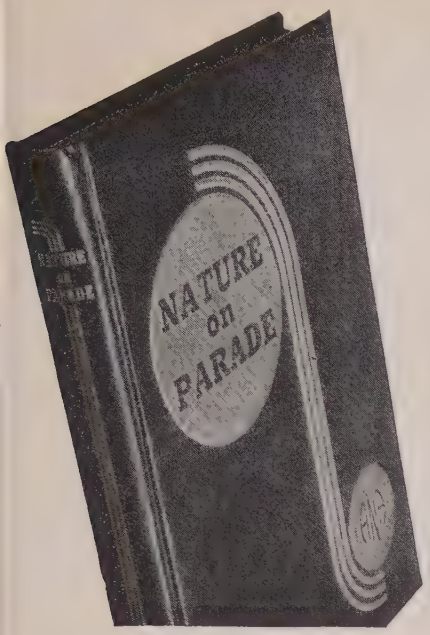

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Azaleas in Texas

Under the auspices of the River Oaks Garden Club of Houston, Texas, more and more azaleas and camellias have been planted about homes and gardens. This program progressed to the point that, four years ago, an Azalea Trail observance was organized. This year will be its fourth celebration, the dates being February 25 and 26. Mingled with the plantings of azaleas and camellias are redbud, dogwood and magnolias, and many other flower and flowering shrub displays. Details may be obtained from the River Oaks Garden Club, Houston, Texas.

A Fern Index

Index to North American Ferns compiled and edited by Maurice Broun, gives the ranges and habitats of the ferns and fern allies of North America and Mexico, including all known forms, varieties and hybrids. In a foreword Charles A. Weatherby, Senior Curator of the Gray Herbarium, expresses the hope that the aid given through this book to students of ferns will compensate Mr. Broun for the long and tedious work devoted to its compilation. The Index is published by The Science Press and copies are available from Maurice Broun, Route 1, Orwigsburg, Pennsylvania, for $2.50.

New England Turtles

The second natural history guide published by the New England Museum of Natural History is entitled *Field Guide to New England Turtles* and is the work of Dr. Harold L. Babcock, Curator of Reptiles. The text description and identification data are supplemented by nine color plates, which picture the eighteen species that have been found there. Both this and the first guide, *The Snakes of New England,* are available, at fifty cents each, from The New England Museum of Natural History, 234 Berkeley Street, Boston, Mass.

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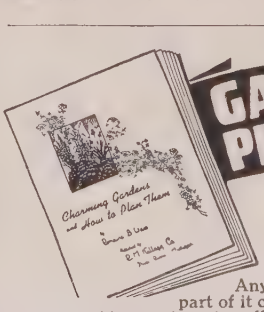

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Camera Trails

BY NORRIS W. HARKNESS

ANDERSON TREE FROG CALLING—A LEICA PHOTOGRAPH BY CHARLES E. MOHR FROM THE FOURTH INTERNATIONAL LEICA EXHIBIT

Nature Photography Indoors

Nature abounds in opportunities for the photographer throughout the year, but some of us are slightly less interested in outdoor work when the mercury goes toward the bottom of the thermometer. This is especially true of the city dweller who is not really equipped for long hours in the cold and who is not accustomed to it. He must miss many chances for splendid pictures, but he need not stow his camera away to await warmer days. He can use the winter hours to derive a two-fold benefit, for he can make interesting pictures of the little, familiar things that are usually neglected, and he can study the making of such pictures so as to perfect his technique for the coming days in the field.

This study may be a combination of the technical and the artistic. On the technical side is learning to handle the camera in quick and sure fashion; becoming so accustomed to it, its functions, its gadgets and adjustments, as to be able to handle it with greater efficiency under adverse conditions. We may discover what apertures we need, how to increase the value of our shots by the choice of the best angle at which to work on a special subject, and the actual mechanics of such operation.

Indoors, too, where there is no wind to bother us and where we can place our lights as we want them, and move our "sun" about, we can find out what compositions will make the most effective pictorial works without losing the value of the picture from the naturalist's viewpoint. Often the two approaches to the picture must clash and we make either Nature studies or pictures in the artistic sense, but the true artist-naturalist who wants the most from his camera will attempt to combine both ideas. He can if he has studied his picture-making from both sides.

The Nature study shows every detail as sharply as possible and leaves nothing to our imaginations. It is in this that the two sorts of pictures are most unlike each other, for the pictorialist will pick some one part of the object, open his lens wider, and let all the remainder be out of focus. A compromise that retains the good features of both can usually be reached by choosing the angle of the object to the camera—the camera angle, as Hollywood calls it. A flower, for example, may be taken at a rather close distance with the lens stopped down just enough to get it all sharp and yet let the stem and other less important parts be less well defined. A tree branch might be treated in much the same way, and many of the things we, as naturalists, want to record will make real pictures if we try to move the camera around them, and up or down, until we have enough of the important things sharp without stopping the lens down to the smallest opening and getting everything in sight equally distinct. Often the informative value of the picture will be higher when this is practised because we shall have called attention to the important things by their sharpness and made the remainder subordinate by its lack of that quality.

For cameras equipped with a ground-glass for focusing, this effect is easy, and it is only necessary to move the camera around while watching the glass. For folding cameras, often with the so-called "portrait lenses" slipped on the camera lens, the same effect may be obtained by opening the back of the camera and fastening a piece of ground-glass where the film usually lies and studying the effect of the motion and the aperture on the glass. The depth-of-field table that came with the camera may also be used by measuring the distance from the camera to the nearest and farthest parts of the subject that we want sharp and seeing whether those distances fit into the measurements given in the table. While doing this, we may also study the effect of different light directions on the final result. A bright bulb—perhaps a photoflood—in a reflector can serve as the sun. Another smaller light—or one at a greater distance from the subject—will keep the shadows from being too dark and yet preserve the illusion of sun-light, which is, of course, a one-source light. Too many strong lights will lose the sun effect, and our pictures will generally be better if we can retain the "feel" of daylight.

We move the source light around as the sun might move and we see the difference that the angle makes. When it is nearly perpendicular to the plane of the object, the whole thing seems to flatten out, but when the angle becomes acute, the texture of the surface and the shape of the object seem more real and definite. At the one best place we fasten the light and then adjust the smaller bulb to throw enough light into the shadows to enable us to record their details. Then comes the step that decides the pictorial value of all we are trying to do, the exact choice of the camera angle and the stop we shall use. Sometimes tilting the camera will do the trick. Perhaps we shall need to move it to another place or change its height. Some one place will seem better than the rest, and there we tighten the camera firmly on the tripod, for our exposure will be too long to allow us to hold it. Then we stop down the lens enough to bring enough of the object into sharp focus without getting everything in sight sharp. We focus on the most important part of the object with the lens wide open—now the stopping down makes nearer and farther things sharp, too. Lastly, we decide on the exposure. A meter is the best guide for the initial attempts, but if none is available, an exposure of one second with the diaphragm set at f/16 will not be far wrong with a film like Agfa Superpan and the photoflood three feet from the subject. Usually it is better to make several exposures at first. Try one at one second, one at two, and one at four and see which makes the best print. That will be a guide to future work.

The print itself will be the best proof of what we have done, and it will suggest other things to try. Sufficiently detailed notes of just what was done will be of tremendous assistance both in studying the prints, and, later, in doing similar things outdoors. We have made these test shots of single flowers; growing plants and single leaves from them; cobwebs; branches of autumn leaves; stones brought in from the fields; wood from the fire-place—nearly everything—and we have learned a lot in doing it. Once in a while, too, some of them made pictures, but the fun of the doing was plenty of reward. We hope you will find it so.

Enlarging

Making enlargements is undoubtedly more fun per minute than any other part of the photographic process, and it is far from the least important for the final print is the thing that will be seen and by which we will be judged as photographers. It is not a mysterious hocus-pocus thing that may "come out" well or badly, but simply the following of certain rules just as is necessary in making contact prints. The two vital things to keep in mind are these: the choice of the proper grade of contrast in the paper we use, and giving it the right exposure.

The equipment needed consists of the enlarger, three trays, developer, stop-bath, hypo, and safe-light. Gadgets may be added to the list, but these are the necessary things. The

developer to use is that suggested by the maker of the paper you prefer. Any of the papers made by the better known manufacturers are good, but we would suggest that you begin with one of the faster kinds like Kodabromo, Velour Black, or Brovira. They are available in a variety of surfaces, but for us it will probably be better if we get a smooth but not glossy paper at first. The developer can be purchased as a powder to be mixed and used as directed on the can. The trays ought to be a little larger than the paper and should be enameled metal, glass, rubber, or stainless steel—all materials that will not be affected by the chemicals we use. The first tray contains the developer, the second the stop-bath made by adding one and one-half ounces of commercial acetic acid to a quart of water, and the third the hypo, mixed as directed on the box. If we always keep them in the same relative positions, we are less likely to put the print into the wrong bath. The safe-light should not shine directly on the developer tray, but should be so placed that it illuminates the whole working space. The amber light is safe for paper if the exposure is not too long, and tongs to handle the wet prints will save our hands and lessen the danger of contaminating one bath with another. The enlarger is set up in accordance with the directions of its maker and we are ready to go.

The negative is put into the carrier, and the white light in the room extinguished. The working part (the head) of the enlarger is moved up or down until the size of the picture is approximately right. Then the image is focused as sharply as possible on the plane in which our paper will lie when the exposure is made. It may be that the size of the picture will have to be changed at this point because the focusing changes the size a little. The next step is to determine just where the paper is to go—that is, just what part of the negative we shall use in the print. Usually we do not use quite all the negative, and it is at this point that we can do much to perfect the composition of the picture. When the picture is decided upon, a final check shows us that we are ready for the exposure. This will vary with the kind of paper, the grade of contrast of the paper, the size of the enlargement, the density of the negative, and the opening in the diaphragm of the lens. With so many variables, we must either use some sort of meter, or make test exposures to determine exactly the best exposure time.

To use a whole sheet of paper for a guessed-at exposure is a silly waste of money, so we cut the paper into strips about an inch and a half wide. One of these strips is laid across the place where the main part of the picture will be and all but about one inch of its length is covered. Then the enlarger light is turned on and that inch is exposed for about five seconds. (We have an old metronome that times things for us.) Another inch of the strip is then uncovered for the same time, and this uncovering the strip in five-second steps is continued until the entire strip has been exposed. Now we shut off the enlarger light and develop the strip for the full time (usually about a minute and a half) and then put it into the stop bath for twenty seconds or more to stop the action of the developer. From there it goes into the hypo for two minutes before we turn on the white light. Remember to put all the unexposed paper back into its envelope before turning on the light. Examination in the bright light will show the right exposure time and enable us to decide whether we have tried the right grade of paper. The exposure should be just enough to veil the high-lights—the lightest areas—with a faint tone. If, when that is right, the blacks are too black, the paper is too contrasty and a softer grade should be used. On the other hand, if the blacks are merely gray when the high-lights are right, a harder grade is needed. Whatever the decision, another test strip is needed with the better paper.

This and That

Did you ever wish you could have brought home a picture of that inaccessible rock that you had such a time in climbing but couldn't photograph because you had no place to stand while you did it? We've had the experience a couple of times. The shots we took with the ordinary camera lens made the rock look very insignificant from the distance at which we had to take it. Now, however, we do better for we have a telephoto lens that makes a much bigger image at a given distance, and we can get a picture not only of the rock but also of birds' nests and a lot of things we couldn't without it. Carl Zeiss, Inc., of 485 Fifth Ave., New York City, has a booklet on telephoto lenses and the Zeiss cameras that will be sent to any Nature reader on request. Be sure to mention Nature Magazine to get the particular selection of booklets prepared for us.

The Trigger Tripod, which will be welcomed by photographers, is a new hand tripod that is built, as its name implies, along the lines of a pistol with our camera serving as the active part of the gun. It furnishes a better grip on the camera when we use both hands, or enables us to operate any camera that has a connection for a cable-release with one hand. The release supplied with the Trigger Tripod may be either Kodak or Compur, and the maker has several special releases for those few cameras that do not use the standard ones. Priced at $1.50, the Trigger Tripod is the product of Photo Utilities, Inc., of 10 West 33rd Street, New York City, who have a pamphlet describing its use for all Nature readers. Please mention this department when you write for your copy.

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Also for the movie worker is the Besbee Universal Title Maker which is being distributed by Willoughby's, Inc., at 110 West 32nd Street. The booklet waiting at Willoughby's for you has a lot of information on the art of good titles and how to make them to complete your films. Write for your copy, and mention Nature Magazine.

If you have not found what you want in this department, we would like to know it and to have your suggestions. And—if we can help you with your special photographic problem, we want to do so. Camera Trails is run for your benefit; take full advantage of it.

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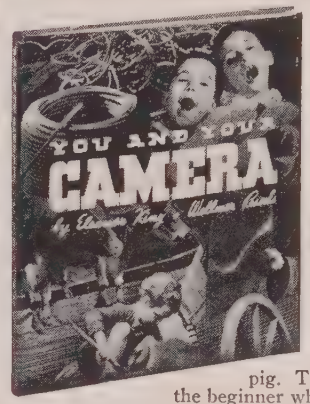

The perfect handbook for the amateur who may not have expensive equipment. Here is a picture of the moon taken through a street telescope. Here are pictures of pigeons, baby owls, a flock of sheep, a close-up of a pig. This book tells the beginner what he needs to know from the artistic point of view—not how to take but what to take. Illustrated with many photographs. "A Splendid 'how' book for all picture-snappers." *Young America.*

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For Your Photographic Files

The following bulletins have been announced from time to time in our Photographic Notes. You may have missed them. Check those you want and send this list, with a three-cent stamp, to: Photographic Editor, Nature Magazine, 1214 16th Street, Washington, D. C.

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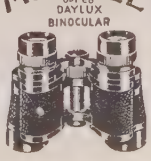

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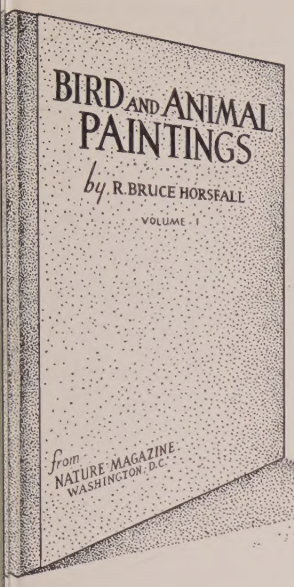

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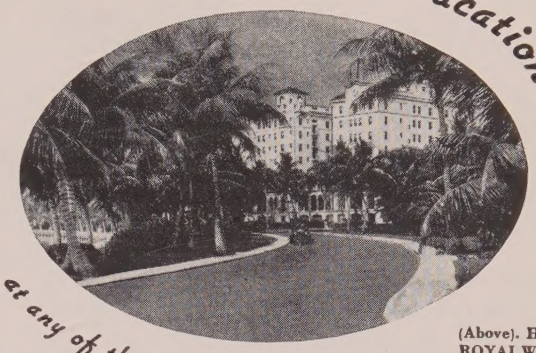

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Indoors and Out

By HOWARD ZAHNISER

"A RIVER went out of Eden," so *The Bible* says, and the Good Book's first account of human geography centers in a description of that unnamed river of Eden and its four tributaries—the Pison, Gihon, Hiddekel, and Euphrates. Thus "Genesis" itself has a valley setting, and Constance Lindsay Skinner, who is editing a series of books on the American Folk for the publishers Farrar and Rinehart, Inc., has good precedence in antiquity for choosing to have these folk sagas told as the story of rivers, "The Rivers of America Series."

Despite the recollection of "Genesis," which is indeed somewhat fanciful, there is a novelty in this plan that increases interest and adds pleasure for the reader. More than novelty, there is fitness in the choice, for the events that have transpired along our rivers encompass most of our important and significant history. Certainly it is delightful for one who is interested in folk ways, or, in other words, in the poetry of group living, to read of them in terms of rivers. "There is magic in rivers," the editor testifies, "beyond their gleaming beauty. They are unending rhythm; even when winter closes over them, in the mind, like remembered verses, they are still flowing. They are the motion in the still land, the vital fluid coursing through the clay body."

Four of the projected twenty-four books on "The Rivers of America" have been published, enough to demonstrate both the unity of purpose in the series and the diversified individual treatment by the various authors. They also are well-distributed samples—from New England and the West, from the nearly sub-tropic Southeast and the northern region of the Upper Mississippi.

Robert P. Tristram Coffin set up a high standard in the series' initial volume, *Kennebec: Cradle of Americans*, published at $2.50, a uniform price for each work in the series. Told with the braggadocio and playful overstatement for which one has an eager expectation from Maine Staters, this cradle hymn of triumph certainly satisfies a reader after folk ways. From the times of the "dawn people," Mr. Coffin tells the human history of his valley, and his homely philosopher Cap'n Cy Bibber provides interpretive comments on the significance of events. Mr. Coffin confesses that the Kennebec is "quite a river." He takes wilful pride in inclement weather, for when it rains, for instance, "the windowpanes look like the walls of an aquarium. You expect to see a haddock look in on you any minute." One chapter is modestly entitled "Good Eating Begins in Maine," and it does whet the appetite. The story of the Maine sailors is called "The River that Flowed Over the World." One knows that Maine has to be quite a State to produce this exuberant book—quite a book.

In *Upper Mississippi: A Wilderness Saga* Walter Havighurst sings the folklore of Americans from Scandinavia. "The two grand themes of American history, it has been said, are immigration and the westward movement. In the Upper Mississippi Valley the two themes were synchronized and fused into one experience, involving such drama, both physical and psychological, as occurs but once in American history." Thus Mr. Havighurst describes his opportunity, and his achievement is equally great. He tells both the story of the prairies and the even more exciting epic of the lumbermen who filled the rivers with logs and established Paul Bunyan in the world's folklore. With this book one can live the lives of the folk of Wisconsin, Minnesota, and the Dakotas with an intimacy usually experienced only in fiction. Mr. Havighurst pays tribute also to the illustrious men whom the region produced—"Another Harvest," he calls the chapter, which includes brief sketches of such men as John Muir, Thure Kumlien who "was the world's greatest authority on birds' nests," Stefansson, and Lindbergh.

It is, however, in Struthers Burt's *Powder River: Let 'er Buck* that the theme of the westward movement is played with a bang and developed with all the variations that the colorful history of Wyoming suggests—from the time of the early explorers and trappers, through the days of the Indian and the cowboy, down to the tourists and dude ranchers, the "Ladies in Pants," to use Mr. Burt's chapter heading. The river "a mile wide and an inch deep" is apparently less important in geography than in language. The stream is little known, but its name has become a challenging call. Struthers Burt is content that this be so and centers his work on the phrase rather than the stream. He is not content to limit his book to the Powder River's drainage area, and thus the book is a strong tale of all Wyoming and essentially of the whole western frontier—its battles, its wild-West heroes, its songs, and all the fullness of its folklore. "The story of Powder River is—in reality—the story of grass," and Mr. Burt makes obvious the drama of men and natural resources.

Somewhat like Powder River in one respect, the Suwannee has been less known as a stream than as a phrase—a nostalgic song-phrase used solely for its sound value by Stephen Foster, who never saw the river where now a granite shaft to him is apparently a somewhat mysterious memorial among folks who know little of the outside world. Cecile Hulse Matschat's *Suwannee River: Strange Green Land* describes these folks, uses their dialect, records their recipes and menus, and retells their hair-raising tales. It is an inclusive report on folklore. At the expense of some annoyance to at least one reader, the book is written in the third person, from the viewpoint of "the Plant Woman," who for a time lives as far as possible the life of the natives, explores the swamp lands where the Suwannee rises, and travels the river to the Gulf. Unlike the other books so far published in this series, *Suwannee River* is the work of a visitor to (Continued on page 118)

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In body size about the size of a killdeer, legwise they have few competitors. A number of this marsh-nesting species, known by the Latin name of *Himantopus mexicanus*, have made their home in a slough beside a heavily-travelled California highway